BULLETIN No. 64

Copyright 1944
By The Railway & Locomotive Historical Society, Inc.

Issued by

The Railway & Locomotive Historical Society, Inc.
Baker Library, Harvard Business School
Boston, Massachusetts

May, 1944

Price for Members $1.00 *Price for Non-Members $2.00*

Transportation
Library

TF
1
.R133
no.69-68

CONTENTS

Transportation

Officers and Directors of the Railway and Locomotive Historical Society, Inc.

CHAS. E. FISHER, *President*
20 Wilde Road, Waban, Mass.

SIDNEY WITHINGTON, *Vice President*
7 Briar Lane, New Haven, Ct.

WARREN JACOBS, *Secretary*
South Station, Boston, Mass.

HAROLD S. WALKER, *Assistant Secretary*
10 Winthrop Ave., Marblehead, Mass.

GEO. P. BECKER, *Treasurer*
96 Avon Hill St., Cambridge, Mass.

JOHN W. MERRILL, *Curator*
148 State St., Boston, Mass.

W. R. FOGG, *Director*
26 Monadnock St., Boston, Mass.

EDWARD HUNGERFORD, *Director*
44 Monroe Ave., Pittsford, N. Y.

DR. ARTHUR H. COLE, *Director*
Librarian, Baker Library, Harvard Business School, Boston, Mass.

ROBERT C. SCHMID, *Director*
266 Maitland Ave., West Englewood, N. J.

G. W. BISHOP, *Resident European Director*
12 Queen's Road, Kenilworth, Warwickshire, England

D. L. JOSLYN, *Resident Western Director*
2164 Castro Way, Sacramento, Calif.

R. L. MARTIN, *Mid-Western Representative*
1509 28th St., Rock Island, Ill.

GILBERT H. KNEISS, *Pacific Coast Representative*
18 Forest Lane, Berkeley, Cal.

ROBERT R. BROWN, *Eastern Canadian Representative*
700 St. Catherine St., West, Montreal, P. Q., Canada

NORMAN THOMPSON, *Western Canadian Representative*
Box No. 2004, Winnipeg, Manitoba, Canada

D. S. BARRIE, *British Representative*
Defending his Country.

CARLTON PARKER, *Exchange Manager*
45 Warren St., Newton Center, Mass.

CHAPTER OFFICERS

of The Railway and Locomotive Historical Society, Inc.

NEW YORK CHAPTER

WILLIAM T. GAYNOR, *Chairman*
c/o New York Central System
Room 1261—466 Lexington Ave., New York, N. Y.

WILLIAM T. PHILLIPS, *Vice Chairman*
9 Wellington Road, Garden City, N. Y.

EDWARD COLGAN, *Secretary*
P. O. Box 434, Grand Central Annex, New York, N. Y.

ROBERT C. SCHMID, *Treasurer*
266 Maitland Ave., West Englewood, N. J.

CHICAGO CHAPTER

JOHN S. INGLES, *Chairman*
P. O. Box 166, Homewood, Ill.

JAMES R. SULLIVAN, *Vice Chairman*
Apt. 2-5-B, 817 East 81st St., Chicago (19), Ill.

MISS VERNA LARSEN, *Secretary*
209 South La Salle St., Chicago (4), Illinois.

LYMAN B. HERRIN, *Treasurer*
Room 1316, 79 West Monroe St., Chicago (3), Ill.

PACIFIC COAST CHAPTER

ERICH THOMSEN, *Chairman*
589 Arch Street, San Francisco, Cal.

G. M. BEST, *Vice Chairman*
511 North Sierra Dr., Beverly Hills, Cal.

S. F. MERRITT, *Secretary-Treasurer*
836 Alma Ave., Oakland, Cal.

D. L. JOSLYN, *Historian*
2164 Castro Way, Sacramento (17), Cal.

The Railway and Locomotive Historical Society,
INC.

COMMITTEE IN CHARGE OF PUBLICATIONS

CHAS. E. FISHER, *Editor* O. KUHLER, *Art Editor*

ROBERT C. SCHMID, *Chairman, Eastern Committee*

C. B. CHANEY C. F. GRAVES H. E. NICHOLS

ROY L. MARTIN, *Chairman, Mid-West Committee*

M. C. POOR

D. L. JOSLYN, *Chairman, Western Committee*

G. H. KNEISS S. F. MERRITT

ROBERT R. BROWN, *Chairman, Canadian Committee*

W. T. COMLEY J. H. EDGAR W. M. SPRIGGS

NORMAN THOMPSON

G. W. BISHOP, *Chairman European Committee*

F. ACHARD J. W. SMITH E. ANDRE SCHEFER

The most typical of our early types of locomotives and one most truly named was the 4-4-0 or American type. A dual purpose type and one that easily conformed to the needs of our early American trains. Probably more locomotives of this type were constructed than any other, but—trains increase in weight and that means "more engine!" In our previous bulletins, Mr. Warner has prepared excellent articles on the American and Atlantic types. There was another type—the Ten-Wheeler, that also did its share in the development of the American locomotive. Closely akin to the American type, the addition of another pair of drivers, this type too could serve a dual purpose. In general, when the 4-4-0's were too light for the "Limited"—the "ten-wheeler" supplanted them. In the mind of your Editor, this type is fully as interesteing as the 4-4-0—it dates almost as far back and it permitted greater tractive effort. America has also seen some fine examples of this type of locomotive and I'm sure that our members will be deeply interested in Mr. Warner's contribution on this subject.

One of our members—Mr. C. F. H. Allen, has always been interested in the Pittsburg, Shawmut & Northern R. R. He has supple-

mented Captain Robinson's contribution that appeared in our Bulletin #61 with three brief articles and I'm sure that our members will appreciate this additional information. We welcome a return to our publication with an article on the Class "O" engines on the Pennsylvania R. R., by Mr. Chaney and one from Mr. Crittenden on the Dismal Swamp R. R.

Last fall our member, Mr. J. W. Barriger, III, read an interesting paper to our Chicago Chapter on our future railroads. In the opinion of your Editor, this paper is of such interest and value that it should be preserved by being reproduced in our columns.

Many of our members are acquainted with Mr. Poor and his knowledge of our Colorado railroads. His history on the South Park railroad, when completed, will be of genuine interest to all of us. Mr. Poor's interest does not cease with the South Park road and we are glad to publish a brief sketch of his on the Argentine Central Ry., a sketch which is in no way related to his South Park history. Mr. Spawn, shortly before entering the service of his country, contributed a brief sketch on Robert Wright, the recipient of the tiny locomotive model deposited with your Society and lastly, if you are interested in knowing which road has the greatest mileage or which one owns the most equipment, Mr. Martin has presented a brief tabulation on this subject which we hope will be of value for reference.

PUBLICATIONS

We are glad to announce the publication of P. R. R. Classification Series No. 2, Part 1 on the consolidation classes (H-6b, H-8 and H-8a) by Norman J. Perrin, 4523 Arabia Ave., Baltimore (14), Maryland. This booklet of 24 pages is a valuable sketch on these classes and will be of interest to our membership. The cost is 50c per copy and they should be ordered directly from Mr. Perrin. Another booklet on the Atlantic type will be ready for distribution shortly.

The customary summer bulletin issued by this Society will not be published this year. There are several reasons for this, amongst them is the paper shortage, but the chief one is that for the past few years your Editor, who not only edits your publications, but distributes them and has all of the cares and worries of their production, feels that he is entitled to a little rest this summer. The restrictions on travel will in no wise hinder the enjoyment of his garden or his back yard and the break in the summer months this year, will be a most welcome one.

COVER DESIGN

The Mountain or 4-8-2 type first made its appearance on the Chesapeake & Ohio Ry. in 1911. It was a type that soon became popular for both freight and passenger service on our railroads. The first of this type that came to New England were ten of the U. S. R. A. design

that came to the New Haven in 1919. They proved so popular on that road that now they are their standard freight locomotive. Some years later the Bangor & Aroostook R. R. took delivery of four and now that road has a total of nine. In 1934 the Baldwin Works delivered five of this type to the Boston & Maine and they have proven themselves to be so satisfactory that additional orders were placed in the years that followed. They have handled heavy freight trains on the Fitchburg Division, they have handled the heavy "East Wind"—the crack passenger train between Washington and State of Maine points, when she was too heavy for their Pacifics, they have taken punishment and given satisfaction. To see them perform, a visit to South Ashburnham will repay one. With good, clean cut lines, they are rather a striking locomotive and our member and artist, Mr. J. H. Barr, has caught one of them in action, swinging around the curve near the Belmont, Mass., depot.

History of The 4-6-0 (Ten-Wheeled) Type Locomotive

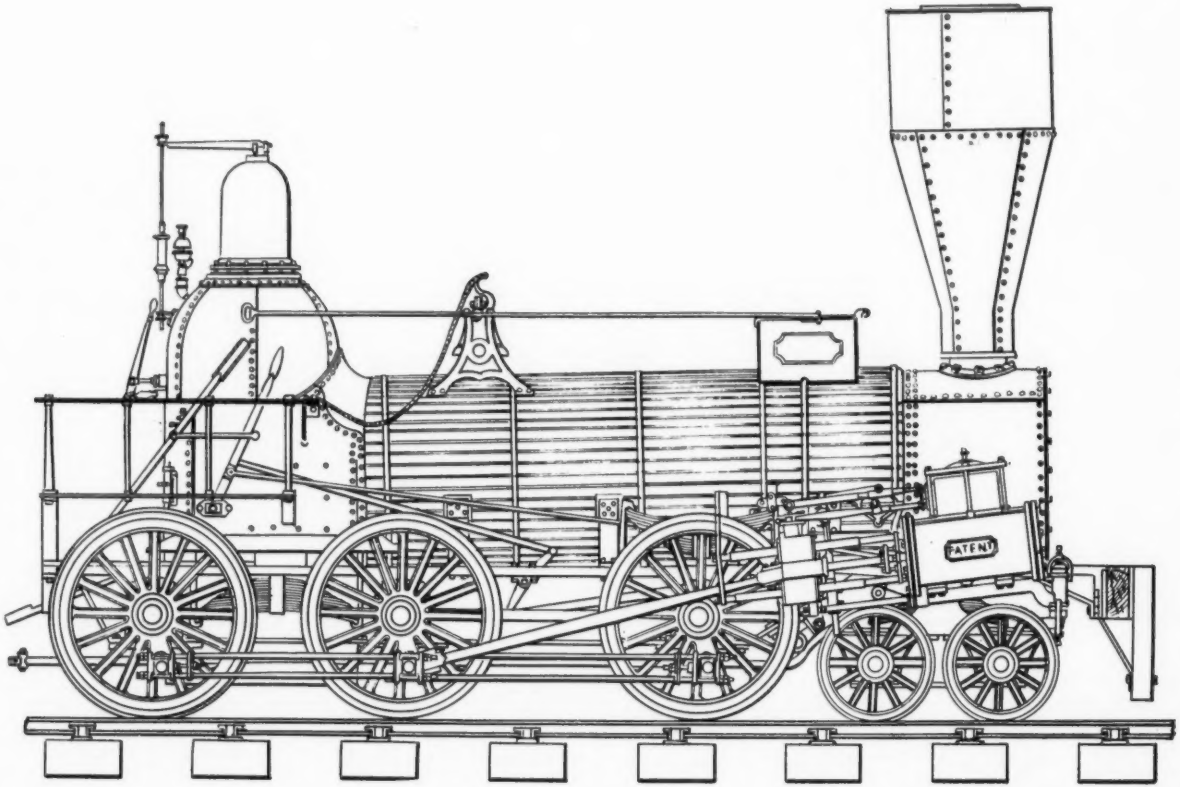
By Paul T. Warner

During the first decade of railroad operation in the United States, locomotive designers were struggling with the problem of developing a basic type that would be suitable for work on light, uneven tracks, sharp curves, and steep grades. By 1840, such a type, thanks largely to the efforts of John B. Jervis, Ross Winans and Joseph Harrison, Jr., was well developed. It was a 4-4-0, with a center bearing swivelling truck, and equalizing beams between the drivers, thus providing a three-point suspension.* It was used in both passenger and freight service, and was being rapidly adopted by the railroads.

The next step was to gain hauling power by increasing the weight on drivers and that meant adding wheels. Matthias W. Baldwin met this demand with his flexible beam truck locomotives, which were of the 0-6-0 and 0-8-0 types. They were held in high repute and did good work, but they involved certain objectionable features such as steeply inclined cylinders and flexible connections for the coupling rods. They also required at least four points of support for the chassis. To meet the competition of these flexible beam truck locomotives, the firm of Norris Brothers, of Philadelphia, brought out a 4-6-0 type locomotive designed by Septimus Norris. This engine was the "Chesapeake," built for the Philadelphia & Reading Railroad and placed on the road in March, 1847. This can justly be regarded as a famous locomotive, for it was the first of a type which soon came into extensive use and which is still being used on many railroads.

The cylinders of the "Chesapeake" were 14½x22 inches in size, and the driving wheels were 46 inches in diameter. The locomotive was rated as weighing 20 long tons—about 44,000 pounds. It had a "hay stack" boiler, with a large dome over the firebox. Wood was used for fuel. The cylinders were inclined, and the main rods were connected to the second pair of drivers. The front and back side rods were entirely independent of each other, the main rod taking hold of a third bearing on the pin, between the two side rod bearings. These side rods were of the open type, each being formed of two rods which were spaced apart vertically so that the crank pin brasses could be placed between them. Nuts on the ends of the rods bore against keepers which held the brasses in place. The first and second pairs of drivers had plain tires without flanges, and the leading truck had a short wheel base and swivelled about a center pin, but carried very little weight. Accounts differ as to the actual service rendered by the locomotive, but it was evidently found desirable to place more weight on the truck. According to the

* The truck was first applied in 1832, by John B. Jervis and Ross Winans, who worked independently of one another. In 1836 Henry R. Campbell designed the first 4-4-0 type locomotive, but it lacked an equalization system and was not successful. Joseph Harrison, Jr., patented the equalizing beam in 1838, and with this device locomotives could be built with coupled drivers, a swivelling truck, and a three-point suspension system.



The "Chesapeake," built by Norris Bros., for P. & R., 1847.

—Courtesy of W. A. Lucas.

Annual Reports of the Philadelphia & Reading Railroad Company, the locomotive was partially rebuilt in 1849. Up to Nov. 30 of that year it had been at work "in coal trade," and had made a total of 38,760 miles. It was again "rebuilt" into what was practically a new engine in June, 1861. It was apparently the only 4-6-0 type locomotive in operation on the Reading until the Millholland "gun boats" were introduced in 1863.

But in the meantime, other roads were using 4-6-0 type locomotives in both freight and passenger service, and the Ten-Wheeler was beginning to play a prominent part in handling heavy traffic on American roads. The early fifties saw the type established on at least three important systems—the New York & Erie, the Pennsylvania, and the Baltimore & Ohio. The locomotives used on these three roads differed in important particulars, and deserve more than a passing reference.

In the issue of the American Railroad Journal for November 26, 1853, there was published an article entitled "Motive Power on the Broad Gauge," which gives a list of the locomotives then used on the Erie. The road, extending westward from the Hudson to the Lakes, had a gauge of six feet, and grades were heavy on certain parts of the line. There were at least 28 Ten-wheelers on the road, from two builders—Rogers, Ketchum & Grosvenor and Swinburne, Smith & Company. The Rogers engines had inclined cylinders, placed inside, with the main rods connected to the second pair of drivers. The largest of these locomotives had 18x20 inch cylinders and 60-inch drivers, and weighed 65,000 pounds, with 49,000 pounds on the drivers. The boiler was 48 inches in diameter, and was for that day of large proportions, with 14 2/3 square feet of grate area and 1,251 square feet of heating surface. These locomotives had outside frames and springs, the latter connected by equalizing beams. The main rods took hold of "half cranks," while the side rods were attached to cranks placed on the ends of the axles outside the frames. Three of the Rogers locomotives, Nos. 33, 34 and 35, were capable of hauling 12 or 13 eight-wheeled loaded cars over grades of 60 feet to the mile, between Piermont and Suffern.

Apparently there were 24 Ten-wheelers built by Swinburne, Smith & Company. All had inside cylinders 17 inches in diameter by 20 inches stroke; six of the locomotives had drivers 60 inches in diameter, while the remaining 18 had 54-inch wheels. An old photograph shows one of the latter, rebuilt with a new boiler, being "worn out" in the Erie yards at Paterson, New Jersey, in 1883. The cylinders were placed immediately above the truck and were horizontal with the main rods connected to the first pair of drivers. The frames were inside the wheels, and the driving springs were connected by equalizers. There was a counterbalance of four segments in the first pair of drivers, one of two segments in the second pair, and no counterbalance, apparently, in the rear pair. The locomotive as shown in the photograph is of course very different in appearance from what it was when originally built.

The first Ten-wheelers for the Pennsylvania were built by Matthias W. Baldwin, who, in 1852, received an order from that road for twelve

The "Chesapeake," built by Norris Bros., for P. & R., 1847.
—Courtesy of W. S. Lacey.

six-coupled freight locomotives. As built, six of these were of the 4-6-0 type, while the remaining six had a single pair of leading wheels placed immediately under the cylinders. This single pair of wheels carried more weight than was considered desirable, and the locomotives were subsequently rebuilt with four-wheel leading trucks. All these engines were outside connected, with the cylinders set at a sufficiently steep inclination so that the main rods, which were connected to the second pair of drivers, could take hold of the pins next to the wheels; the coupling rods being outside. The drivers were 44 inches in diameter, the cylinder dimensions being 18x22 inches. With the four-wheeled leading truck, the total weight was 64,500 pounds, with 46,100 pounds on drivers. The boiler had a straight barrel with a raised roof to the firebox, which extended down between the second and third pairs of drivers.

The Baltimore & Ohio locomotives, to which previous reference has been made, were placed on the road in 1853 and 1854, and were in some respects the most interesting of these early groups of Ten-wheelers. They were designed by Samuel J. Hayes, then Master of Machinery of the road, primarily for the purpose of working passenger trains over the 17-mile grade of 116 feet to the mile, between Piedmont, West Virginia, and Altamont, Maryland. In this they were successful, and as they did good work in freight service also, they proved to be a useful "all-around" class.

There were, all told, 17 of these Hayes locomotives, and they were built by A. W. Denmead & Son, Baltimore; New Castle Manufacturing Company, New Castle, Delaware; Smith & Perkins, Alexandria, Virginia; and the Railroad Company. All had 19x20-inch cylinders and 50-inch driving wheels, and weighed 60,000 pounds, with 48,000 pounds on the drivers.

In the Hayes Ten-wheelers the influence of the Winans "Camel" design was plainly apparent; but the two must not be confused, for the "Camels" were of the 0-8-0 type, and Winans was strongly opposed to building Ten-wheelers. The Hayes engines had the three pairs of drivers placed as close together as possible, with moderately inclined cylinders placed above a short wheel-base truck, and main rods connected to the second pair of drivers. The firebox was entirely back of the third driving axle, and the roof sloped toward the rear at a steep angle, as in the Winans "Camels." A large cab was placed on the boiler ahead of the firebox, and the dome was in the cab. The frames were of the bar type and were extended backward past the sides of the firebox. Feed water was supplied by half-stroke pumps worked from the rear crank pins, and independent cut-off valves were applied to the cylinders.

In these locomotives the first and second pairs of driving wheels had plain tires without flanges, and the rigid wheel base was the distance between the center of the front truck and the rear drivers, or 15 feet 8 inches. The driving wheel loads were equalized so that the equivalent of a three-point suspension system was provided.

That these locomotives were held in high esteem is indicated by the fact that over 20 years after their introduction, when John C. Davis was Master of Machinery, a considerable number of the same class, but

having link motion valve gear and wide spread trucks, were built in the company's shops. One of these locomotives, numbered 217, was exhibited in 1927 at the Fair of the Iron Horse. Unfortunately it was named Ross Winans—after a man who was in no way responsible for its construction, and who, as has been said, was opposed to the building of 4-6-0 type locomotives.

Following the Hayes Ten-wheelers, the Baltimore & Ohio placed in service, in 1857, a group of nine locomotives designed by Henry Tyson, who was then Master of Machinery, and known as the "Tyson Ten-wheelers." Seven of these locomotives were built by the Denmead firm in Baltimore, and two in the shops of the Railroad Company. Ross Winans was asked to bid for the construction of these locomotives, but he declined to do so; and the result was a spirited discussion (in writing) between him and Mr. Tyson, regarding the respective merits of the Ten-wheeled type and the famous Winans "Camels." The Tyson locomotives were far more normal in design than were the Hayes Ten-wheelers that preceded them, and they apparently did good work in freight service. They had 18x24" cylinders and driving wheels about 50 inches in diameter, and weighed about 60,000 pounds in working order.

Before referring to locomotives built for other roads, brief reference must be made to one more group of Ten-wheelers built for—and by—the B. & O. These were the Perkins' engines, which were built in 1863 and operated in passenger service over the heavy grades between Piedmont and Grafton. One of them, with the name "Thatcher Perkins" on the side of the cab, was re-conditioned in 1927 for the Fair of the Iron Horse, and was also exhibited at the New York World's Fair held in 1939 and 1940. The Perkins Ten-wheelers had 19x26-inch cylinders, and weighed about 90,000 pounds. One engine had driving wheels 64½ inches in diameter;* six had 60-inch drivers, and the remaining four, 58-inch drivers. As in the case of the Tyson engines, the valve gear was of the Gooch, or "stationary link" type. The Perkins locomotives worked passenger traffic over the "seventeen mile grade" for nearly 30 years, and made a fine record in this difficult service.

By the time the Perkins ten-wheelers were built, the American locomotive had developed into a well-proportioned, reliable machine, representing a general design which was retained for many years. Much of the credit for the refinements which had been introduced during the ten years preceding 1863, was due to the work of William Mason, of Taunton, Massachusetts. Mason's specialty was building cotton mill machinery, but he entered the locomotive field in 1853, and at once began to beautify his locomotives and to refine their design by a careful study of details, discarding various features which had been ungainly in appearance. The majority of the Mason engines were of the 4-4-0 (American) type, but the influence of his work was apparent in all types of locomotives constructed by other builders. The type of boiler generally used in the 4-4-0, for burning wood or bituminous coal, had a deep firebox placed between the frames and driving axles; the latter

*Changed to 60" shortly after the locomotive was built.

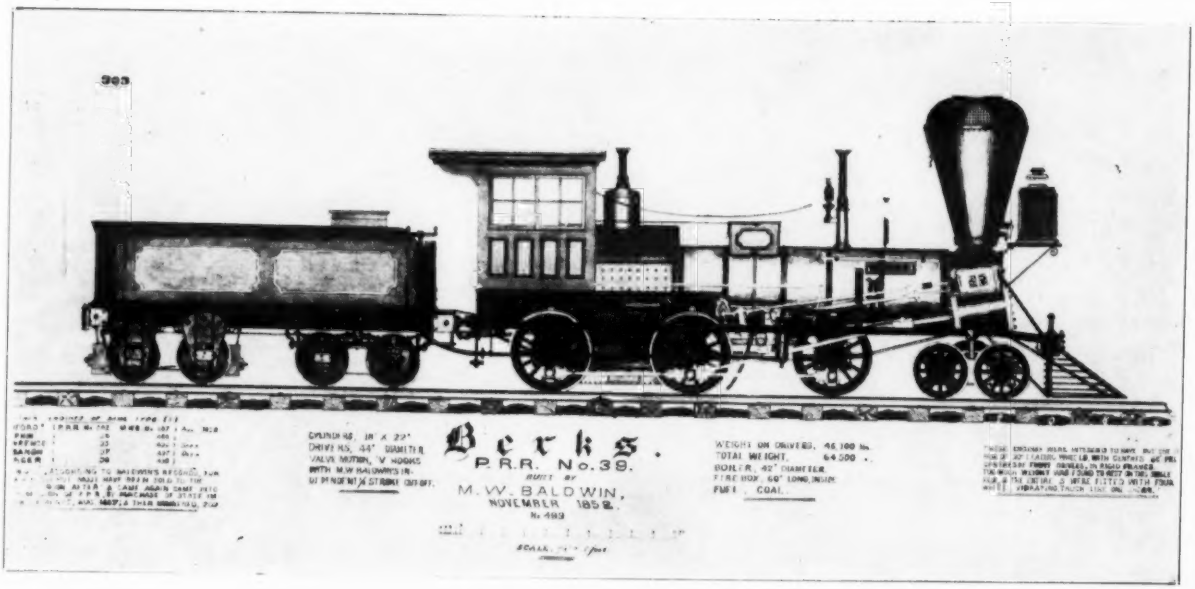
being spread sufficiently to provide the necessary room. For burning hard coal, a long firebox was used, extending back over the rear axle. The Ten-wheelers were similarly built; if a deep firebox was used the driving wheel spacing was uneven, as the first and second pairs were placed close together, with a wide spread between the second and third pairs. During the 1860's and 1870's, the Pennsylvania and many other roads placed in service large numbers of engines which were so constructed. The hard coal burners had long fireboxes extending back over the rear driving axle, in order to secure more grate area; and this permitted the drivers to be more evenly spaced.* The scheme was also tried —at least on the Lackawanna—of using a wide firebox placed entirely back of the drivers. This, however, was not perpetuated, as it involved difficulties in coupling the tender to the locomotive, and the short driving wheel base and overhang at the rear tended to make the locomotive unsteady.

During the years 1859 to 1874, William Mason, previously mentioned, built 47 locomotives of the 4-6-0 type for the Lehigh Valley Railroad. These were hard coal burners for freight service, all of them having 17x24-inch cylinders and driving wheels 48 inches in diameter. They were peculiar in that the driving wheels were compactly grouped on a short wheel base, and were placed well back, the main rods being connected to the first pair of drivers—instead of the second pair, as was the usual practice. Angus Sinclair, in his book "Development of the Locomotive Engine," says (page 319): "The Mason engines were favorites among the enginemen. They had the main wheel forward, which made them flexible on curves and free from nosing. They were very good steamers and powerful engines for their weight, the drawbar between engine and tender being offset so that in starting a heavy train part of the weight of the tender was thrown on the drivers."

Most, and probably all, of the Mason engines as originally built, had balloon or diamond stacks. These were later replaced by straight stacks, and as so altered the writer, when a boy, frequently saw the Mason locomotives. He remembers being impressed by the position of the drivers, and also by the conspicuous brass bead around the base of the stack cap; a characteristic feature on many Lehigh Valley locomotives fifty or more years ago.

In 1863, James Millholland, Master of Machinery of the Philadelphia & Reading Railroad, and one of the finest locomotive designers of his day, built the first of a series of highly successful 4-6-0 type freight locomotives, which became popularly known as "gun boats." The first of these engines was the "Nevada," which was followed, during succeeding years, by over 150 others, all of which had certain basic features in common. The "gun boats" were, in many respects, similar to the "Hiawatha" class of 4-4-0 type passenger locomotives, which appeared in 1859. The "gun boats" all had cylinders 18 inches in diameter; two strokes were represented, 22 and 24 inches, and two sizes of driving

*The Perkins Ten-Wheelers on the B. & O., although they burned bituminous coal, had a grate about 7 feet long placed above the rear driving axle, with the drivers evenly spaced.



—Courtesy of Baldwin Locomotive Works.

One of the first Ten-wheelers built for the P. R. R. (From a drawing by C. H. Caruthers.)

wheels, respectively 46 and 54 inches in diameter. The boiler, designed for burning hard coal, had a long firebox placed above the frames, and the crown and roof sheets sloped toward the rear at a fairly steep angle. There were two steam domes, with a balanced throttle valve in the forward one, and a dry pipe extending back to the rear dome, so that the steam supply was drawn from both. Two-bar guides were used on the earlier "gun boats"; the bars were round, and the crosshead slipped over them, and it had a packed gland in each opening to take up wear. The front end of the main rod was made with a fork, which embraced the crosshead; and a well designed arrangement of Stephenson link motion was applied. Later, a four-bar guide was used. The cylinder castings on all the "gun boats" were extended until they met on the center line of the locomotive, and provided a flat bed on which the smokebox rested. An interesting feature of the earlier locomotives was the cab, which was of iron, with a dome-shaped roof on top of which was a spherical ventilator. The sand boxes were first placed right-and-left, under the running boards; but later, a single sand box was used, and was placed on the boiler between the domes, with the bell mounted on top of it. There was a sliding damper in the smoke stack, near the top, for checking the draft.

Such, in brief, were the "gun boats," which worked main line freight traffic until the advent of the Wootten boiler in 1877—and were conspicuous on the Reading for many years thereafter. One of the last of the series, Number 405, was built at the Reading Shops by a group of apprentices in 1876, and was exhibited at the Centennial Exhibition held at Philadelphia during that year.

At the time engine 405 was built, John E. Wootten, General Manager of the Philadelphia & Reading Railroad, was experimenting with the use of waste anthracite, or culm, in locomotives. In 1877 he took out a patent covering a boiler specially designed to burn such fuel, and the first locomotive with the new boiler—a 4-6-0 type, numbered 408—was built at the Reading Shops. As far as its machinery and running gear were concerned, this locomotive was very similar to the "gun boats"; but the boiler was radically different. It had a wide, shallow firebox, placed above the drivers, with a combustion chamber extending forward into the barrel. The grate was composed of water tubes and cast iron bars, and a feed-water heater, utilizing some of the exhaust steam, was applied. The water was forced through the heater by means of a pump driven from one of the rear crank pins. All these special features were covered by patents.

Engine 408 was followed by others of similar design, one of which —Number 412—was shown at the Paris Exposition held in 1878. This engine was subsequently tried on railways in France and Italy, where it burned low-grade fuel successfully. In order to come within the clearance limits of those roads, the cab, which was originally placed on top of the firebox, was moved forward and placed over the boiler barrel. Thus there was introduced a design of locomotive, locally known on the Reading as "camel backs," but on various other lines as "Mother Hubbards." The origin of the second nick-name is unknown.

An article published in London Engineering gives a description of the Reading locomotive exhibited at Paris, and refers to the change in the location of the cab. This article was reprinted in the volume entitled "Recent Locomotives," published by the Railroad Gazette in 1882. The article is illustrated by drawings showing an engine numbered 408, but the Annual Reports of the Railroad Company definitely state that Number 412 was the one sent to Paris. Apparently the 408 and other road engines of similar design, originally built with the cab over the firebox, were subsequently changed by moving the cab forward. As Wootten boiler locomotives increased in size, this location was almost invariably adopted. To place the cab on top of the firebox would have exceeded the height limit, and had it been placed entirely behind the firebox there would have been a long overhang back of the rear drivers.

During the 1880's, increasing dimensions in the soft-coal burning Ten-wheelers were forcing changes in boiler design. The deep firebox, placed between the frames and the second and third driving axles, was given the maximum dimensions permitted by an axle spread of nine feet, which was used in some locomotives. By placing the eccentrics on the first axle, as was occasionally done—a practice not to be recommended—it was possible to use a grate seven feet long, with about 20 square feet of surface. If more grate area was required the boiler was raised and the firebox extended back over the rear axle; the mud ring being placed either between the frames or on top of them, as had been done for many years in hard coal burners. The big soft-coal burning Ten-wheeler, with firebox over frames, was well established by 1890.

While, as has been pointed out, some of the early 4-6-0 type locomotives were used in passenger service, it was not until the latter eighties and the early nineties that the use of Ten-wheeled passenger locomotives became in any sense general. By that time, trains had grown so heavy that, in many cases, 4-4-0 type locomotives were incapable of handling them. The heaviest track construction then in use did not permit axle loads in excess of 35,000 to 40,000 pounds, and this placed a strict limit on the power that could be developed with the 4-4-0 type. The 4-6-0 was the logical successor of the 4-4-0, as it permitted a 50 per cent increase in starting tractive force with no increase in axle loading; while it was possible to use wheel diameters of 72 to 78 inches, giving these locomotives ample speed capacity for fast schedules.

In 1889, the New York, Lake Erie & Western Railroad received, from The Baldwin Locomotive Works, a group of 4-6-0 type passenger locomotives which weighed 127,000 pounds, with 98,000 pounds on drivers. They were hard coal burners, using lump anthracite on grates eleven feet long; and with 20x24-inch cylinders, 68-inch drivers and a steam pressure of 130 pounds, they developed a tractive force of 15,600 pounds. At the time of their construction they were among the heaviest passenger locomotives in existence. The design was subsequently revised and improved, and the pressure raised to 160 pounds. Locomotives having generally similar characteristics, but with shorter fireboxes, were also built for burning bituminous coal; and these Ten-wheelers did good work on the Erie for many years.

In 1890, the Baldwin Works supplied the Baltimore & Ohio with eight 4-6-0 type locomotives, which were placed in passenger service between Keyser and Grafton. They operated over the famous 17-mile grade, replacing the Perkins Ten-wheelers which had been in service on that difficult run for nearly thirty years. The new locomotives were slightly heavier than the Erie engines previously mentioned; they had 21x26-inch cylinders, and with drivers 62 inches in diameter, and a steam pressure of 160 pounds, developed a tractive force of 25,120 pounds. On test, one of them developed 1,300 indicated horsepower, which was considered exceptionally high at that time.

The extensive locomotive exhibit at the World's Columbian Exposition, held at Chicago in 1893, included several notable examples of the Ten-wheeled type. Among these were two engines with the old design of deep firebox between driving axles; one, built by the Schenectady Locomotive Works, for the Chicago & North Western Railway, and the other built by The Baldwin Locomotive Works,* and shown attached to a handsome train exhibited by the Pullman Company. In the Schenectady locomotive, the ratio of grate area to heating surface was as 1 to 107, while in the Baldwin locomotive it was as 1 to 98. In neither case was the grate area adequate to insure a rate of evaporation in proportion to the amount of heating surface. In contrast to these locomotives was one built by the Pittsburgh Locomotive Works for the Terre Haute & Indianapolis Railroad (Vandalia Line). This engine had a long firebox placed above the frames, the ratio of grate area to heating surface being 1 to 70. An even larger grate would have been an advantage, but this would have necessitated increased length of firebox and would have added to the total weight of 138,000 pounds which, at that time, was high for a 4-6-0 design. The Pittsburgh locomotive measured approximately 15 feet 6 inches from rail to top of stack, and with trim, clean-cut lines was an imposing machine.

An interesting group of Ten-wheelers were the Class X (later G3) locomotives for the Pennsylvania Lines West of Pittsburgh, which were built at the Fort Wayne, Indiana, Shops in 1893. They had 19x24-inch cylinders with ports 23 inches long, and slide valves that were rather heavy; and trouble was experienced due to springing of certain parts of the valve motion, which was of the Stephenson shifting link type, as almost universally used at that time. To overcome this trouble, the Allen valve gear, with straight links, was substituted, and it was apparently successful. A drawing of the gear, with a brief description, was published in the Railway Review of December 9, 1893.

In 1896, the Baltimore & Ohio adopted the 4-6-0 type for its "Royal Blue Line" passenger service between Philadelphia and Washington, where the fastest schedules called for an average speed of nearly 46 miles an hour. The new locomotives, built by Baldwin, had driving wheels 78 inches in diameter, and were originally fitted for burning coke; but as this did not prove entirely satisfactory, bituminous coal was substituted. The boiler was of the extended wagon-top type, with

* This locomotive was subsequently sold to the Intercolonial Ry. of Canada.

a long firebox placed above the frames; and all the driving springs were underhung. Fears were expressed that the locomotives would prove unsteady at high speeds, but these fears proved groundless, as the new engines were highly successful. One of them, Number 1310, was reconditioned and exhibited in the Pageant held at the Fair of the Iron Horse in 1927, where it attracted most favorable comment because of its handsome appearance.

During the nineties, and for a few years thereafter, compound cylinders were applied to 4-6-0 type locomotives built for various railroads. Two principal types were represented; the Vauclain, with one high- and one low-pressure cylinder on each side, as built by The Baldwin Locomotive Works; and the two-cylinder, or cross-compound design, with a high-pressure cylinder on one side and a low-pressure on the other, as built by various builders. Space does not permit an extended discussion of these systems of compounding, for which rather extravagant claims were made. Many of the locomotives did fine work and saved fuel and water, but maintenance expenses were high; and the majority of the compounds were rebuilt with single expansion cylinders before being scrapped.

Baldwin Locomotive No. 20,000, a compound Ten-wheeler built early in 1902 for the Plant System of railways, was of special interest by reason of its unusual design. The boiler was of the Vanderbilt type, with a cylindrical, corrugated firebox; and it was the first locomotive to which Baldwin balanced compound cylinders were applied. The high-pressure cylinders were between the frames and the low-pressure outside, and all four pistons were connected to the leading pair of driving wheels, which had a crank axle. The locomotive, when completed, was found to be too heavy for service on the Plant System, and it was subsequently sold to the Chicago Short Line. The balanced system of compounding was later applied to a number of Baldwin Ten-wheelers, some built for domestic roads and some for export. In several designs, the drive was divided, the low-pressure (outside) cylinders being connected to the second pair of driving wheels. In all cases, the crank axle was on the leading pair.

During the nineties, the 4-6-0 type underwent an interesting development on the Lake Shore & Michigan Southern Railway. This road, with easy grades throughout practically its entire main line, used moderate sized power in both passenger and freight service. Thus, in 1893, when the "Exposition Flyer" was operated between New York and Chicago by the New York Central and the Lake Shore, on a 20-hour schedule, the former road used a 4-4-0 type weighing about 120,000 pounds, with 19x24-inch cylinders, and drivers either 70 or 78 inches in diameter. On the Lake Shore, the train was hauled by locomotives of the same type, but having 17x24-inch cylinders and 72-inch wheels, and weighing only 104,600 pounds. These locomotives, built by the Brooks Locomotive Works, were specially designed for this particular service, and they proved capable of doing the work satisfactorily. For heavier trains, the Lake Shore used a 4-6-0 type, also built by Brooks, and having the same size cylinders, but with 68-inch wheels. These locomotives

—Courtesy of Baldwin Locomotive Works.

One of the Hayes Ten-wheelers. No. 198 was built by the Baltimore & Ohio R. R. Co., 1854.

weighed 118,000 pounds, and had boilers of liberal size, with 28 square feet of grate area and a heating surface of 1603 square feet. One of them, No. 564, made a great name for itself when, on October 24, 1895, it hauled a special train from Erie to Buffalo, a distance of 86 miles, in 70 minutes 46 seconds. The average speed was 72.9 miles an hour, and the maximum speed attained, 92.3 miles an hour. The train was run through from Chicago to Buffalo, and west of Erie was hauled by 4-4-0 type locomotives as described above. These engines, however, were beaten by the 4-6-0, which made the highest speed of any of the locomotives used. Ample boiler power undoubtedly contributed to this result. It may be noted that, due to tire wear, the driving wheels of engine 564 were actually 66 inches in diameter at the time the run was made. The train consisted of three cars, weighing 304,500 pounds.

Late in 1896 the Schenectady Locomotive Works built ten fast passenger locomotives of the 4-6-0 type which, although weighing the same as the earlier Brooks engines, represented a marked increase in capacity. The grate area and driving wheel diameter were not changed, but the cylinder diameter was increased from 17 to 18 inches, the boiler diameter from 52 to 56 inches, and the steam pressure from 180 to 190 pounds. The total heating surface was increased from 1603 to 1852 square feet. This increase in capacity without a corresponding increase in weight was accomplished by careful designing and the use of cast steel for driving wheel centers, foot plates, and various other details. The crank pins were of Krupp crucible steel, hollow bored. Another change was the use of radial stays in the firebox, instead of the heavier crown bars that were used in the Brooks design.

Contemporary with these locomotives were lighter Ten-wheelers for freight service, weighing about 108,000 pounds. They had 17x24-inch cylinders and 56-inch drivers, and carried a pressure of 160 pounds. They were built by several builders.

In 1899 the Lake Shore abandoned its policy of using comparatively light power, and purchased two lots of heavy Ten-wheelers from the Brooks Locomotive Works, for passenger and freight service respectively. The first of the passenger locomotives, which was completed in October of that year, weighed 171,600 pounds, and was announced by the builders as "The heaviest express passenger locomotive ever built."* Eleven of these locomotives were turned out; they had driving wheels 80 inches in diameter, and were designed to handle a 14-car train at 60 miles an hour on level track. The boiler carried a pressure of 210 pounds, and had a long firebox, with radial staying, placed above the frames. The steam distribution was controlled by slide valves. The height to the top of the stack was 15 feet 3 inches, and the locomotives were imposing in appearance and of exceedingly trim design.

The locomotives for freight service were somewhat smaller, with 62-inch drivers and a total weight of 154,000 pounds. The leading dimensions of these various classes of Lake Shore engines are given in Table I.

One of the Hayes Ten-wheelers. No. 198 was built by the Baltimore & Ohio R. R. Co., 1854. —Courtesy of Baldwin Locomotive Works.

* This statement was in error, as the Pennsylvania's Class E1 (4-4-2 type), built earlier in the year, tipped the scales at 173,450 pounds.

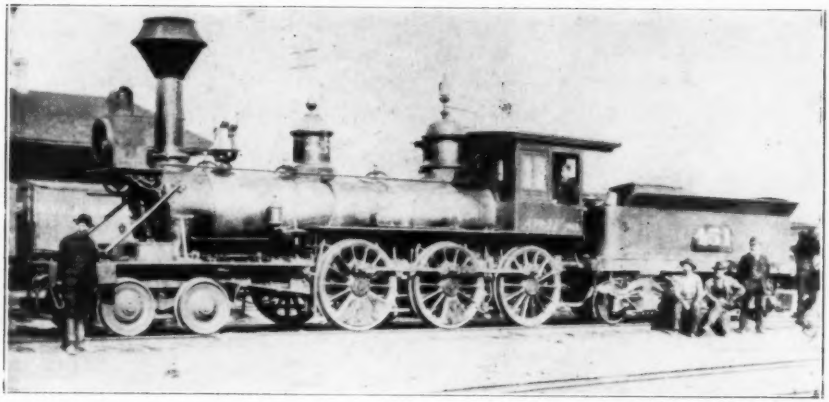
In 1900, a second group of passenger locomotives, similar to those described above but having piston valves, was turned out at the Brooks Works. These engines immediately preceded the first lot of Prairie (2-6-2) type passenger locomotives for the Lake Shore, which had wide fireboxes, and attracted much attention because of the unusual features of their design.

The catalog of the Brooks Locomotive Works, published in 1899, illustrated and described a number of notable Ten-wheelers—apart from the Lake Shore engines referred to—which were built during the latter nineties. Among these should be mentioned eight locomotives built in 1898, for the Great Northern Railway, and represented by engine number 150, which was illustrated in the catalog. This design, with 63-inch drivers and a rated tractive force of 34,020 pounds, was suitable for either passenger or freight service.

These Great Northern locomotives represented the most advanced practice of the Brooks Works at the time they were built, and are worthy of a brief description, as their design included some unusual features. The boiler, 70 inches in diameter and carrying a pressure of 210 pounds, had a Belpaire firebox, the sides and top of which were formed to a long radius—instead of being flat—and were stayed radially. The barrel course just forward of the firebox was tapered, and the dome was mounted on it. Triple riveting was used for the principal circumferential seams, and the longitudinal seams were lap jointed with six rows of rivets. The builders claimed that this construction was "lighter and more flexible" than the butt jointed design used by other makers, but the butt joint was perpetuated, and not the lap. The firebox contained a brick arch supported on water tubes, and was carried on expansion brackets.

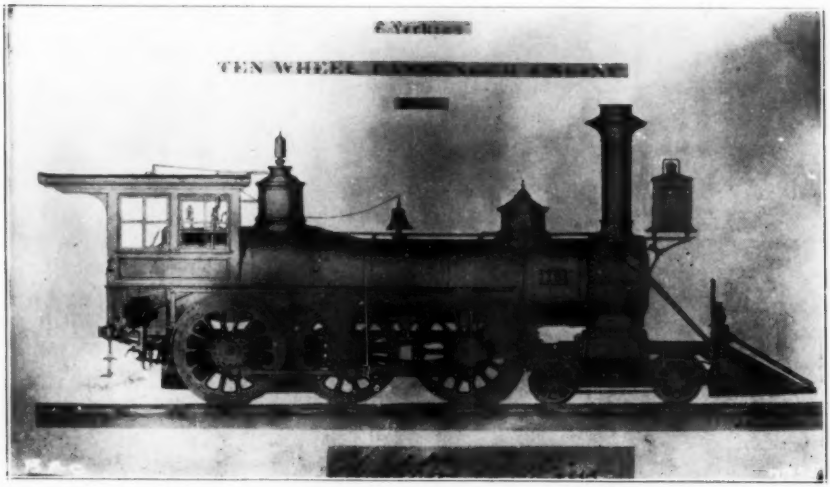
The Brooks Works were pushing the piston valve at the time these engines were built, and the valves on the Great Northern locomotives were 12 inches in diameter, with inside admission, and operated by Stephenson link motion. The maximum valve travel was 7 inches, the steam lap 1⅛ inches and the exhaust clearance ⅛ inch. In order to give maximum starting power, the valves were set with a negative lead of ⅛ inch. They were so located as to make the steam and exhaust passages as direct as possible, and to minimize the amount of offset in the valve gear.

Open-hearth cast steel was used for the driving wheel centers, driving boxes, spring saddles, crossheads, cylinder heads, pistons, expansion brackets (under the firebox), foot plates and certain smaller details. The spring rigging was unusual in that the leading drivers were cross-equalized by a transverse leaf spring whose ends rested on the spring saddles, while the main and rear drivers were separately equalized. The frames were supported on half-elliptic springs placed between the main and rear axles on each side, and on full ellipties at each end of the equalizing rigging. As the front truck was center bearing, the locomotive chassis thus had two center supports ahead of the main drivers, with a principal support on each side, between the



—Courtesy of W. A. Lucas.

N. Y. L. Erie & W. #451. Built by Swinburne, Smith & Co., Dec. 1850. Rebuilt, Dunkirk Shop 1869, new boiler. Photo April 21, 1883 at Paterson Freight Yard. Note third rail 6' 0" track in foreground. Engine is 6' 0" gauge being "worn out" in yard service after Erie had been standard gauged in 1880.



—Courtesy of C. B. Chaney.

B. & O. #18. Perkins 10-wheeler, 1863. Drawn by J. Snowden Bell.
Drawing signed by Thatcher Perkins.

main and rear drivers. The builders claimed that this system of support "has given excellent service, and produces a remarkably steady and easy riding engine." It is difficult to see, however, why it should be in any way superior to the conventional arrangement of equalizing the three pairs of drivers in a continuous system on each side of the locomotive.

These Great Northern locomotives, when tested on heavy grades in Montana, showed a maximum indicated horse-power of 1468 and an average of 922, when burning low-grade coal. It was also claimed that they developed a tractive force of 36,000 pounds when cutting off at 20 inches, or 2/3 stroke. This, however, may be questioned, as it represented a ratio of adhesion of only 3.6 and exceeded the rated tractive force by 2,000 pounds. But there is no doubt that these Great Northern engines were remarkable machines, and showed rather bold designing at the time they were built.

Another notable order for Ten-wheelers, which was filled by the Brooks Works in 1899, covered 40 locomotives for the Union Pacific. They were distinctly for freight service, had 57-inch drivers, and developed a rated tractive force of 33,400 pounds. The boiler was of the extended wagon-top type, with crown-bar staying instead of Belpaire; and the steam distribution was controlled by balanced slide valves. The arrangement of the spring rigging was similar to that applied to the Great Northern locomotives and previously described. In accordance with Union Pacific practice at that time, a short smokebox and a diamond stack were applied; the stack was 42 inches high, and its top was 15 feet, 7½ inches above the rail. This gave the locomotive a striking appearance, and the design attracted not a little attention at the time.

Contemporary with the locomotives just described were a large number of other fine examples of the 4-6-0 type, built for various railroads by different builders. Representative designs are listed in Table II. All the locomotives included in this table burned bituminous coal, and all had long fireboxes placed above the frames and between the drivers. This of course imposed a serious restriction on the firebox dimensions, and none of the locomotives had sufficient grate area to burn coal at a reasonably economical rate when developing horse-power up to the full capacity of the cylinders. The Chesapeake & Ohio locomotives, for example, were built under a guarantee to haul a passenger train weighing 400 tons up a grade of 84 feet to the mile, 7 miles long, at a speed of 25 miles an hour. To do this, approximately 1400 indicated horsepower would be required, and coal would have to be burned at the rate of over 160 pounds an hour for each square foot of grate area. A material increase in grate area could have been obtained only by raising the boiler and placing the firebox entirely above the drivers, resulting in a shallow box with a small amount of volume in proportion to the grate area. Subsequent to 1900, many Ten-wheelers were built that way, some of them with drivers as large as 6 feet in diameter. It is to be doubted, however, whether such locomotives were entirely sat-

isfactory; for with comparatively small firebox volume, incomplete combustion and an excessive amount of smoke were liable to result when burning high volatile coal. As far as relative volume was concerned, the old style deep firebox, placed between frames and driving axles, was far better proportioned than the longer and more shallow boxes placed above the frames or entirely above the wheels.

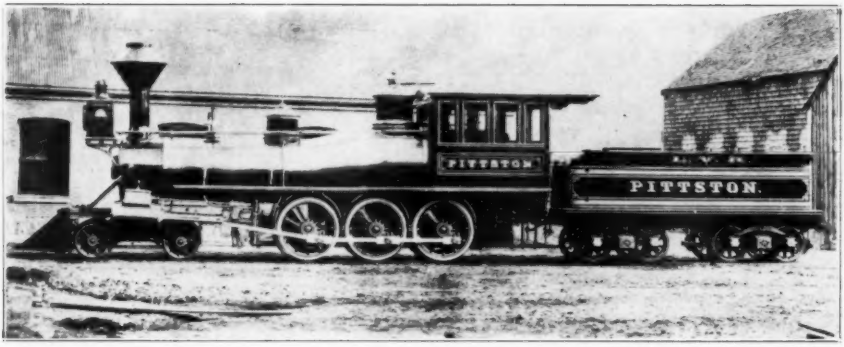
The principal dimensions of representative soft-coal burning Ten-wheelers, with wide fireboxes, are given in Table III. Many of these locomotives rendered excellent service; but with the appearance of the Pacific (4-6-2) type in 1902, the Ten-wheeler rapidly lost prestige as a main line engine. It reached its peak, especially for passenger service, in locomotives such as those built for the Baltimore & Ohio, the Lake Shore, and the Chesapeake & Ohio, to which previous reference has been made.

One of the largest groups of heavy Ten-wheeled locomotives in service today is on the Pennsylvania System, which has 90* locomotives of Class G5s, built in 1923 and 1924 at the Altoona Works of the Railroad Company. These engines were primarily designed for suburban passenger service, but they are suitable for all-around work that is within their capacity. The locomotives have Belpaire boilers, and conform to Pennsylvania standards existing at the time they were designed. Their principal dimensions are listed in Table III.

The status of the big hard-coal burning 4-6-0 was somewhat different from that of the soft-coal burner. The general design of boiler originated by John E. Wootten in 1877, and built either with or without a combustion chamber soon became a common sight on roads which used anthracite as fuel. With this type of boiler, sufficient depth of furnace for burning hard coal could be obtained in locomotives having driving wheels as large as 6 feet in diameter. This ultimately made possible the designing of a 4-6-0 suitable for either fast freight or heavy passenger service, with driving axle loads of 50,000 to 60,000 pounds, and correspondingly high-rated tractive force, that could successfully burn inferior grades of anthracite. Such locomotives, operating on roads like the Philadelphia & Reading, Central Railroad of New Jersey, Lehigh Valley, Delaware, Lackawanna & Western, and several others, proved to be among the most successful of their time and had no superiors as all-around road engines.

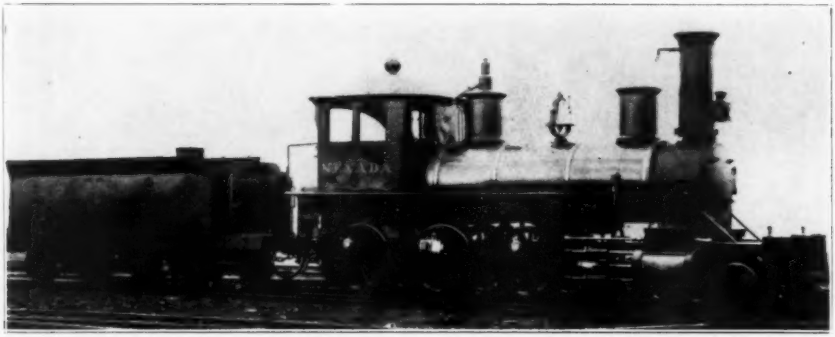
Reference has been made to the first Reading Locomotives with Wootten boilers, which were of the 4-6-0 type, and were built in 1877. These locomotives, which were of moderate dimensions for that time—excepting their grate area—were the first of an interesting series of Reading Ten-wheelers, which were built for fast freight service, and which showed a steady increase in weight and capacity. A considerable number of these locomotives, built during the 1890's, had Vauclain compound cylinders, which were later replaced with single expansion cylinders. This series of freight locomotives reached its culmination in Class L7a, designed by the Railroad Company in 1905. Four locomo-

* In addition, 31 locomotives of this class were built for the Long Island R. R.



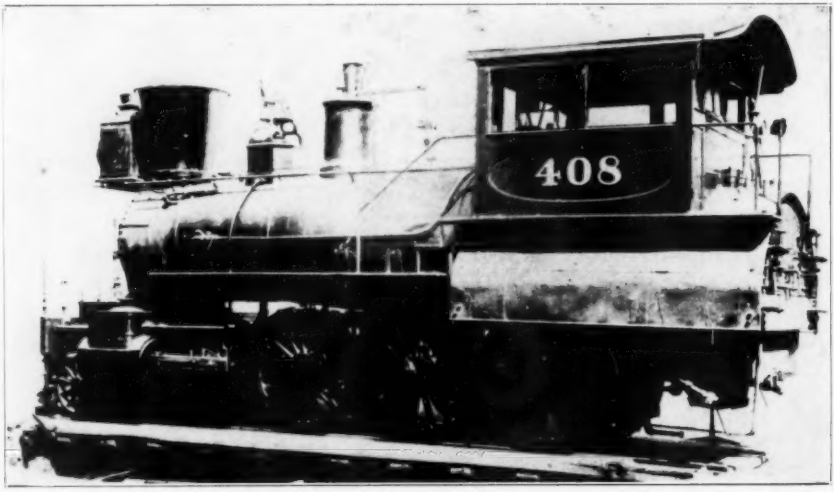
—Courtesy of C. E. Fisher.

L. V. "Pittston," Mason 1870.



—Courtesy of Geo. M. Hart.

The First Reading "Gun-boat." Reading Shops 1863.



—Courtesy of Geo. M. Hart.

The First Locomotive with Wootten Boiler—Reading Shops 1877.

tives of this class, numbers 602 to 605, were built in that year by The Baldwin Locomotive Works, and were followed in 1910 by ten more, numbers 606 to 615, which were built in the Reading Shops. As built, these locomotives used saturated steam; they had 22x28-inch cylinders, and with driving wheels 68½ inches in diameter and a steam pressure of 205 pounds, they developed a rated tractive force of 34,540 pounds. The boiler had a combustion chamber, as specified in the original Wootten patent of 1877. Nearly 20 years experience with the Wootten boiler had brought about a great improvement over the original design, which included several weak features—notably the sloping roof over the firebox, the raised water space at the back of the combustion chamber, and a mud ring built of plates flanged to a U-shaped section. A few years after the introduction of this type of boiler, the roof sheet had been made horizontal, and the flanged mud ring had been replaced by a solid bar of rectangular cross section. Subsequently the flat areas in the outside firebox sheets were eliminated as far as possible, permitting a far better arrangement of the staybolts than in the older design.

The Class L7a locomotives, as originally built, had Stephenson link motion and balanced slide valves. They were used in fast freight service, but were subsequently partially rebuilt with superheaters, piston valves and Walschaert gear, and were transferred to passenger service, together with a considerable number of somewhat lighter Ten-wheelers of generally similar design. The 4-4-0 (American) type locomotives, of which the Reading had a large number, were being steadily retired; and the rebuilt Ten-wheelers replaced them, to a considerable extent on the Main Line to Reading and Pottsville, the Bethlehem Branch, and various other parts of the System. They are still on the active list, and the writer knows from personal experience, that they are doing fine work. The fuel used today is a mixture of buckwheat anthracite and bituminous coal.

Two other Reading Ten-wheelers must be mentioned, the 675 and 676, which were built at the Reading Shops in 1911. The former was built with three cylinders, and the latter with two; the locomotives being, in other respects, of duplicate design. Engine 675 had Walschaerts valve gear for the outside cylinders and a Joy gear for the inside cylinder; Walschaerts gear was used on the 676, and both locomotives had piston valves. A medium-temperature superheater was built into the front end of the boiler barrel; this was later removed and replaced by a high-temperature superheater of the Schmidt type, and Engine 675 was rebuilt with two cylinders. Both locomotives are at work today, in passenger service. With their 74-inch drivers, trim outline and fine workmanship and finish, the writer has always considered them the handsomest central-cab Ten-wheelers he has ever seen.

Reference has been made to the Mason Ten-wheelers used on the Lehigh Valley Railroad. There were also in service a considerable number of 4-6-0 type locomotives built chiefly by Baldwin and the various shops of the Railroad Company. For some years after the success of the Wootten boiler had become established, the Lehigh Valley continued to build hard-coal burners with long, narrow fireboxes placed above the

frames. With such a design the grate area was limited to about 38 square feet, and lump anthracite was used as fuel. With the need for still larger grate area, a modified design of Wootten firebox was adopted, in which the combustion chamber was omitted. This arrangement, which has been generally credited to Alexander Mitchell, Master Mechanic at Wilkes-Barre, did not infringe the Wootten patents. The first Ten-wheelers with boilers so designed to be built for the road by the Baldwin Works were turned out in 1891. They had 19x24-in. cylinders and driving wheels 55.3 inches in diameter, and were used in freight service.

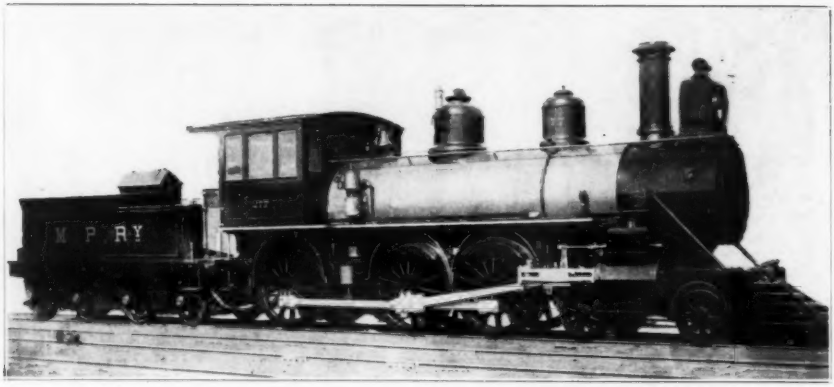
In 1895, a new design of Ten-wheeler, also built by Baldwin, was placed on the Lehigh Valley. The cylinder dimensions were increased to 20x24 inches; some of the locomotives had 62-inch drivers, while in others the wheel diameter was increased to 68 inches, a size suitable for either fast freight or heavy passenger service. Dimensions continued to increase, and in 1901 Baldwin turned out seven Ten-wheelers with Vauclain compound cylinders, a grate area of 71.2 square feet, and drivers 72 inches in diameter, which were designed to haul a passenger train weighing 400 tons back of the tender from Mauch Chunk to Glen Summit Springs at an average speed of 30 miles an hour. The grade on this stretch is constantly ascending, reaching a maximum of 69 feet per mile. The locomotives were subsequently rebuilt with single expansion cylinders (Class J-54).

The central-cab Ten-wheeler reached its culmination on the Lehigh Valley in Class J-55, over 100 of which were built by the Baldwin Locomotive Works and the American Locomotive Company during the years 1904 to 1910. These were among the most satisfactory "all-around" locomotives ever used on the Lehigh Valley, and they successfully worked all kinds of road traffic, both freight and passenger. They had boilers of the modified Wootten type, with straight back flue sheets and rocking grates; all were originally built with slide valves, the Stephenson link being used at first, while the later locomotives in the group were fitted with Walschaerts gear. Many were subsequently rebuilt with superheaters; in some, the original cylinders were retained in combination with Universal valve chests, while in others, new piston-valve cylinders 23 inches in diameter were applied. This change increased the rated tractive force from 31,180 to 37,400 pounds.

Large numbers of these fine locomotives have been scrapped, but they are on record as being among the most satisfactory engines of their general design that have ever been built.

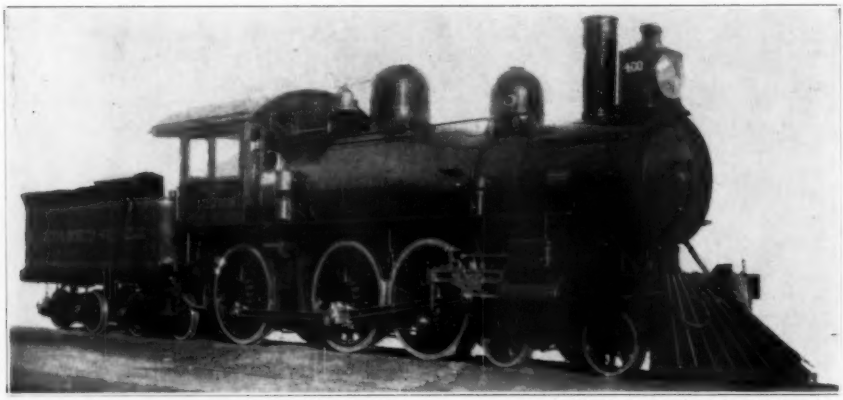
On the Delaware, Lackawanna & Western, the central-cab Ten-wheeler reached its highest development in the 1000 Series, built 1900-1910. There were 39 of these locomotives altogether, subdivided into groups as follows:

Road Nos.	1001-1007	Brooks Locomotive Works		1900
Road Nos.	1008-1012	American Locomotive Co.	(Schenectady)	1905
Road Nos.	1013-1023	American Locomotive Co.	(Rogers)	1906, 1907
Road Nos.	1024-1036	American Locomotive Co.	(Schenectady)	1908, 1910
Road Nos.	1050-1052	American Locomotive Co.	(Rogers)	1907



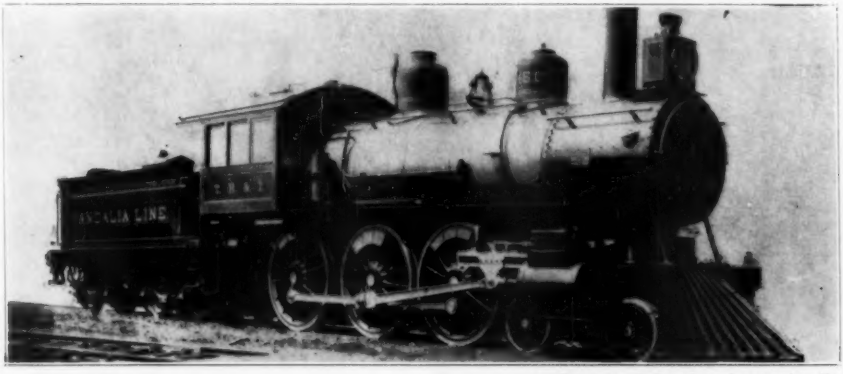
—Courtesy of Baldwin Locomotive Works.

Built by Baldwin for Missouri Pacific Ry. 1886. 20x24"—63"—Grate area 20 sq. ft. Eccentrics on first driving axle to give maximum room for firebox. 2nd and 3rd driving axles 9' 0" cent. to cent.



—Courtesy of American Locomotive Co.

C. & N. W. #400. Schenectady—1893. One of the last big 4-6-0's with deep firebox.



—Courtesy of American Locomotive Co.

Vandalia #1450—Pittsburgh 1893.

All had 69-inch drivers, with the exception of engines 1050-1052, which were intended for service on the Buffalo Division and had 73-inch wheels. Engines 1001-1007 were of typical Brooks design, with 20x28-inch cylinders and piston valves. A few years after they were built, new slide-valve cylinders, ½ inch larger in diameter, were applied. Numbers 1008-1016 were built with Stephenson gear and slide valves, while Number 1017 and those that followed had piston valves and Walschaerts gear. All were later equipped with superheaters. The boilers were of the modified Wootten type, and the majority of the locomotives had grates with an area of 103.8 square feet—probably the largest grate ever used in a 4-6-0 type. In 1937-1938, nine of the locomotives were rebuilt with the cab at the rear. The entire group has now disappeared from the Lackawanna roster, the locomotives having been scrapped or otherwise disposed of.

These big Ten-wheelers made fine records on the Lackawanna, and were highly regarded by all who were concerned with their operation. Shortly after they were superheated, the writer, while on a visit at Scranton Shops, heard them described by a Lackawanna official as "the best Ten-wheelers in the world."

Various grades and mixtures of anthracite and bituminous coal were used from time to time. When drafted to suit the fuel, they were famous steamers, and a former motive power official of the road has told the writer that with a 750-degree pyrometer to register superheated steam temperatures, the pointer was "off the scale half the time." This was hard on valve and cylinder packing, but it meant another car over the Pocono Grade when hauling Number 3—the Lackawanna Limited.

Firing one of these locomotives was quite a job; the fireman stood on the tender, and had to make allowances for the fact that he was shovelling coal into a boiler carried on another vehicle. The Lackawanna engines had a single wide door opening, with a divided door which swung right and left; and with a grate nine feet wide, it took an ambidextrous fireman to land coal in the back corners. It was customary to clean the fire before starting over Pocono Mountain; this required about seven minutes, and it was anything but an easy job with the engine doing 60 or more miles an hour. The Lackawanna engines provided unusually good protection for the fireman; but in snowy weather, with the side curtains in place, the snow would blow up between the engine and tender and would, of course, melt, soaking the fireman's clothing and everything else.

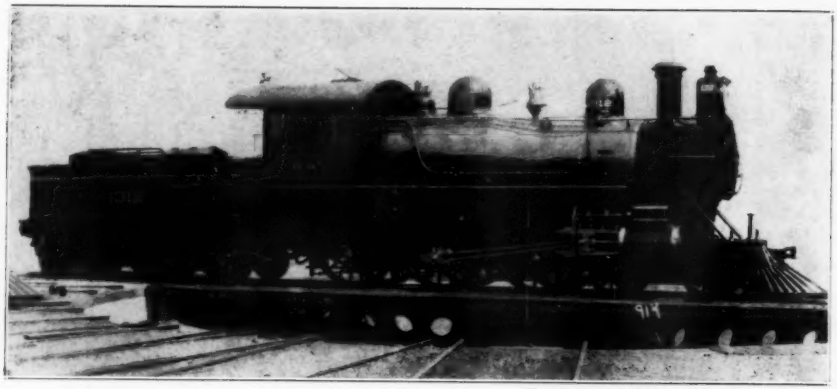
In the forward cab of a "Mother Hubbard," the engineman was comfortable, except in the possible event of a rod breaking or the locomotive being sideswiped. In such cases it was difficult to get out of danger. Locating the cab fittings in a locomotive of this design was also something of a problem, and became more and more difficult as engines increased in size and more gadgets and appliances were required. On the Lackawanna Ten-wheelers, the two injectors were outside and in front of the cab, with extended handles for their operation, and the brake valve was back of the engineman and high up alongside the boiler; while the throttle was worked by a rotating shaft which extended

through the right side of the dome, and had an external connection with the throttle lever.

The locomotives which have been discussed, together with additional examples built for other roads, are listed in Table IV.

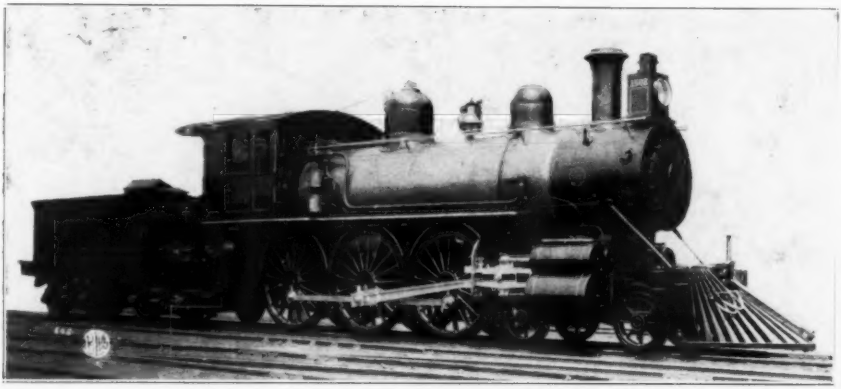
It has been possible, in this historical review, to refer to only a fraction of all the notable 4-6-0 type locomotives that have seen service on American railroads. Doubtless many readers will be disappointed because their favorite locomotives have not been mentioned, or listed in the tables; but we have endeavored to select designs that showed a definite trend in the development of the type, and that were notable because of their constructive details; and these locomotives represented the work of various builders, and were used on railroads in practically all parts of the country.

It is safe to say that, looking back over the past 80 years, no type of locomotive—with the exception of the 4-4-0—has had such a wide field of usefulness as has the 4-6-0. It has made an enviable record in general road service; and while it has largely been retired from main line work in this country it is far from extinct and will, let us hope, stay on the active list for many years to come.



—Courtesy of Baldwin Locomotive Works.

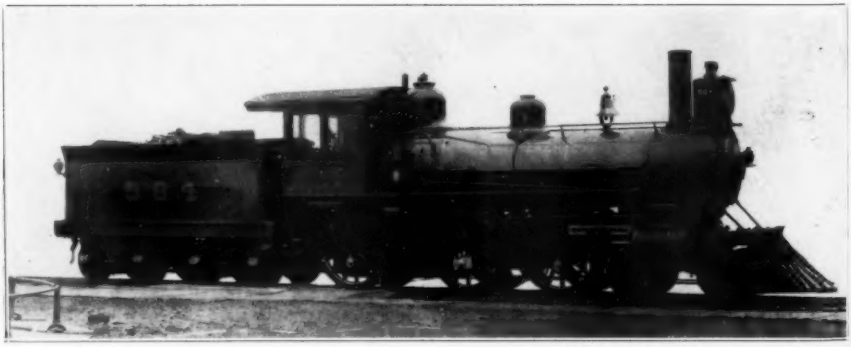
B. & O. #1312. Baldwin—1896.



—Courtesy of Baldwin Locomotive Works.

Built by Baldwin, 1892—14-24x24"—72".

Duplicate of experimental compound No. 82, which was built in 1891 and tried out on various roads.



—Courtesy of American Locomotive Co.

L. S. & M. S. #564. Brooks—1891.

TABLE I

4-6-0 Type Locomotive, Lake Shore & Michigan Southern Railway

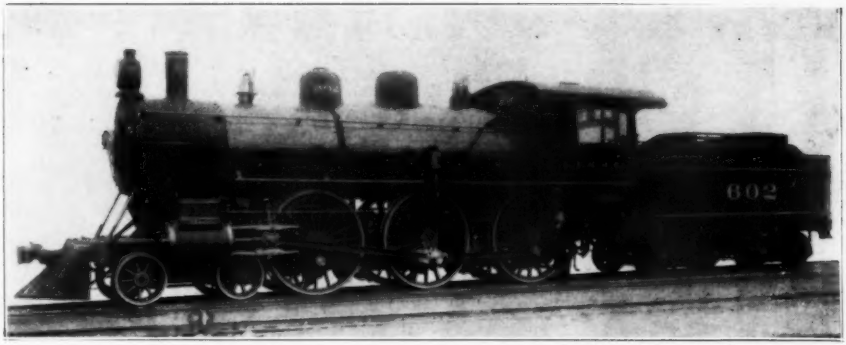
	Builder	Date	Cylinders	Drivers	Steam Pressure	Grate Area	Heating Surface	Weight on Drivers	Weight Total	Tractive Force
					PASSENGER					
1	Brooks	1891	17x24	68	180	28	1603	96,000	118,000	15,570
2	Schenectady	1896	18x24	68	190	27.3	1867	88,000	118,000	18,520
3	Brooks	1899	20x28	80	210	33.6	2917	133,000	171,600	24,990
					FREIGHT					
4	Brooks	1897	17x24	56	160	22.6	1434	79,500	108,000	16,880
5	Brooks	1899	19½x30	62	180	32.4	2173	120,000	154,000	28,200

TABLE II

Heavy 4-6-0 Type Locomotives With Long Fireboxes Over Frames
Soft Coal Burners—Arranged According to Total Weight

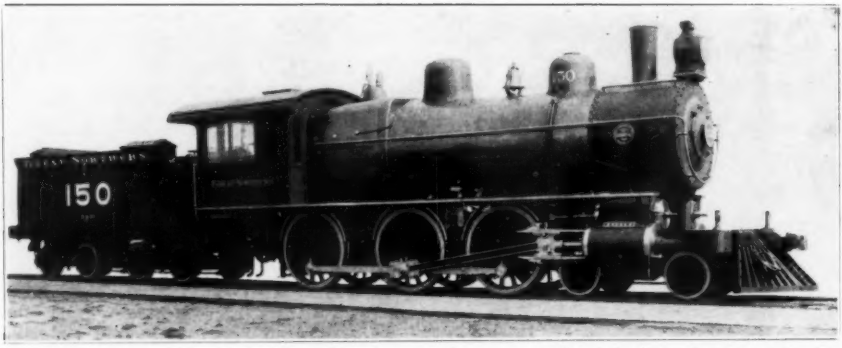
	Road	Date	Builder	Cylinders	Drivers	Steam Pres.	Grate Area	Heating Surface	Total Weight	Weight on Drivers	Tractive Force
1	Atlantic Coast Line	1898	Baldwin	19x26	63	180	28	2327	101,000	134,000	22,860
2	Vandalia Line	1893	Pittsburgh	20x26	72	180	31.9	2230	110,000	138,000	22,140
3	A. T. & Santa Fe	1897	Dickson	19½x28	73	180	25.5	2196	110,000	140,000	22,350
4	Balto. & Ohio	1896	Baldwin	21x26	78	190	34.3	2160	113,000	147,000	23,750
5	N. Y., N. H. & Hart.	1904	Baldwin	21x26	72	200	34.7	2666	114,900	150,700	27,100
6	Southern	1897	Richmond	21x28	72	200	34.9	2410	121,250	158,000	29,200
7	Union Pacific	1899	Brooks	20x28	57	200	31.3	2574	130,000	165,000	33,400
8	New York Central	1899	Schenectady	20x28	70	200	30.3	2886	127,500	165,500	27,200
9	Great Northern	1898	Brooks	20x30	63	210	35.4	2677	129,500	166,000	34,000
10	Chi., Mil. & St. P.	1900	Baldwin	15 25x30	68	200	31.5	2745	133,300	172,400	26,950*
11	Northern Pacific	1897	Schenectady	22 34x26	63	200	34.2	2863	126,000	172,500	24,000*
12	Ches. & Ohio	1899	Baldwin	22x28	72	200	34.5	3000	126,200	173,000	32,200
13	Pennsylvania	1900	R. R. Co.	20x28	72	225	30.8	2816	140,500	184,300	29,750
14	Wabash	1905	Baldwin	21x28	73	220	33.5	2796	149,100	193,300	31,680
15	Southern Pacific	1907	Baldwin	22x26	63	190	32	2994	159,800	203,000	34,770

* Working Compound.



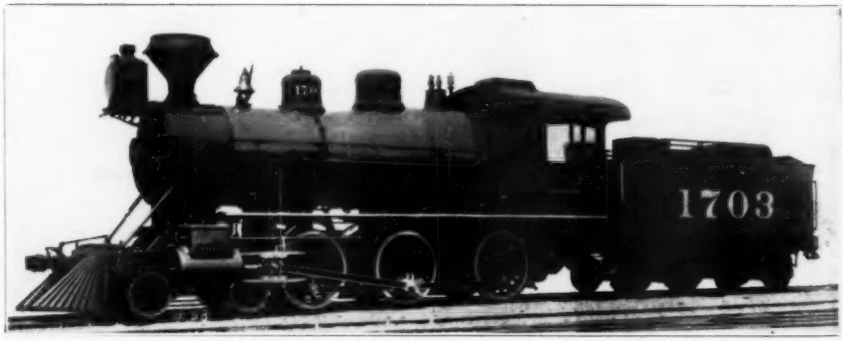
—Courtesy of American Locomotive Co.

L. S. & M. S. #602. Brooks—1899.



—Courtesy of American Locomotive Co.

G. N. #150. Brooks—1898.



—Courtesy of American Locomotive Co.

U. P. #1703. Brooks—1899.

TABLE II—ADDENDA

1. First of a series of Coast Line Ten-wheelers to be be fitted with copper-capped stacks, and known as "copper heads."
2. Exhibited at World's Columbian Exposition, Chicago.
3. For passenger service between Topeka and La Junta.
4. High speed passenger service, Philadelphia Division.
5. Replaced the 4-4-0 type in Shore Line express passenger service.
7. Diamond stack; fitted to burn Wyoming coal.
9. Fast freight and heavy passenger service; Brooks "improved" Belpaire boiler and piston valves.
10. Vauclain four-cylinder compound; fast freight service.
11. Two-cylinder cross-compound.
12. Guaranteed to haul 400-ton passenger train up 84-ft. grade at 25 miles an hour.
13. Class G4; also built with 62″ drivers for fast freight service (Class G4a).
15. Associated Lines standard design, equipped for burning oil.

TABLE III

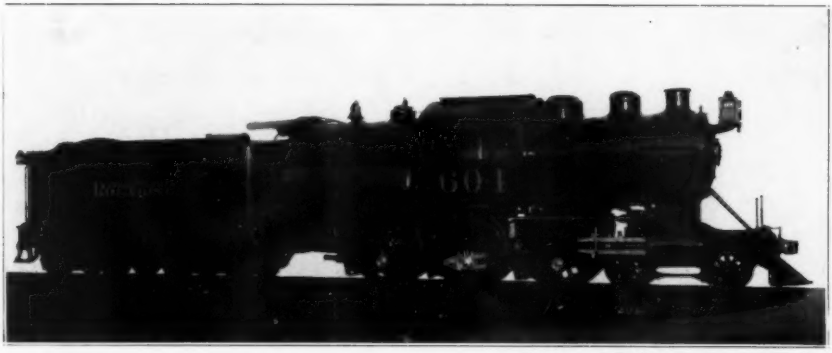
Heavy 4-6-0 Type Locomotives With Wide Firebox Over Rear Drivers
Soft Coal Burners—Arranged According to Total Weight

	Road	Date	Builder	Cylinders	Drivers	Steam Pres.	Grate Area	Heating Surface	Total Weight	Weight on Drivers	Tractive Force
1	N. Y., Chic. & St. L.	1907	Baldwin	20x26	72	200	41.8	2600	113,700	156,400	24,600
2	Atlantic Coast Line	1913	Baldwin	20x26	63	200	44.1	2038 400*	125,200	169,700	28,100
3	Southern	1903	Baldwin	21x28	72	200	44	2655	128,700	170,900	29,200
4	Boston & Maine	1904	Am. Loco. Co.	20x26	72	200	46	2819	130,000	171,000	24,600
5	Chi., Rock Is. & Pac.	1905	Baldwin	22x26	63	200	44.9	2587	131,200	173,700	34,000
6	Chi. & No. Western	1905	Am. Loco. Co.	21x26	63	200	46.4	2959	134,000	176,000	30,900
7	Erie	1903	Baldwin	19x26	68	200	52.2	2505	132,100	176,400	23,400
8	Denver, N. W. & Pac.	1905	Am. Loco. Co.	20x28	57	180	49.8	3058	138,500	182,000	30,100
9	Northern Pacific	1902	Baldwin	15½ 26x30	63	200	50.1	3059	144,800	190,100	31,300x
10	Chi. & East. Illinois	1905	Baldwin	15½ 26x26	62	225	46.7	3094	145,300	191,100	31,050x
11	New York Central	1905	Am. Loco. Co.	22x26	69	200	54.9	3305	148,000	194,500	31,000
12	St. L. - S. Fran.	1907	Baldwin	23x26	69	200	47.7	3039	141,000	194,500	33,900
13	Oregon Short Line	1909	Baldwin	22x28	69	200	49.5	3029	161,200	205,200	33,400
14	St. L. - S. West.	1916	Baldwin	22x28	69	200	49.6	2474 532*	165,200	209,400	33,400
15	Pennsylvania	1923	R. R. Co.	24x28	68	205	55.2	2855 613*	178,000	237,000	41,330

* Superheating Surface
x Working Compound.

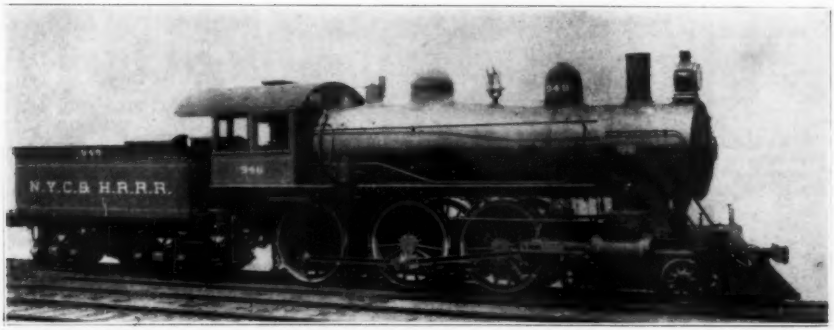
—Courtesy of G. R. Frying.

P. R. R. Class G5s.



—Courtesy of Baldwin Locomotive Works.

P. & R. #604. Baldwin—1905.



—Courtesy of American Locomotive Co.

N. Y. C. #948. Schenectady—1899.

TABLE III—ADDENDA

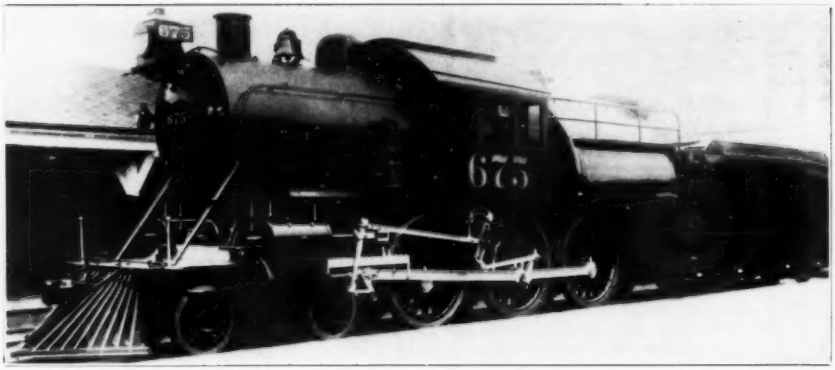
2. Final development of the "Copper heads."
5. First Baldwin Ten-wheelers to be fitted with Walschaerts valve gear.
7. Suburban express service; originally designed to burn anthracite (pea size). The "Harvey Springstead" was one of this series.
9 Vauclain four-cylinder compound.
10. Baldwin balanced compound; outside (low-pressure) cylinders connected to second pair of drivers.
13. Associated Lines standard locomotive.
15. Class G5s; designed especially for suburban passenger service.

TABLE IV

Heavy 4-6-0 Type Locomotives With Wootten and Modified Wootten Fireboxes
Hard Coal Burners—Arranged According to Total Weight

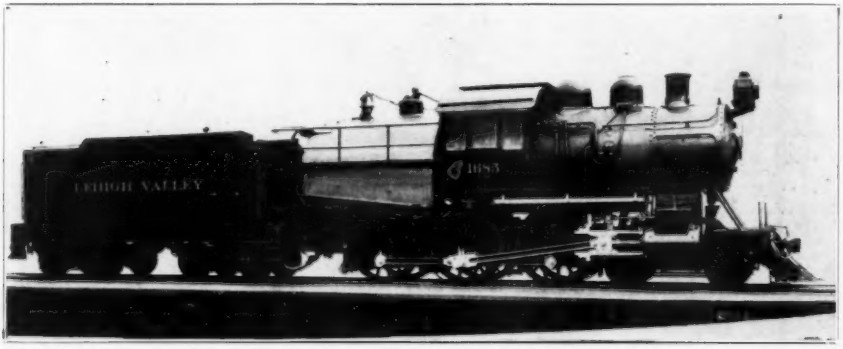
	Road	Date	Builder	Cylinders	Drivers	Steam Pres.	Grate Area	Heating Surface	Total Weight	Weight on Drivers	Tractive Force
1	Long Island	1899	Brooks	21x26	60½	180	69.5	2030	115,000	151,000	29,030
2	Cent. R. R. of N. J.	1902	Brooks	19x26	69	210	67.7	2187	120,000	161,000	24,300
3	Long Island	1901	Baldwin	20x26	68	200	74.9	2804	126,900	171,900	26,000
4	Del. & Hudson	1903	Am. Loco. Co.	21x26	72	200	84.8	2663	131,500	175,000	27,100
5	Cent. R. R. of N. J.	1903	Am. Loco. Co.	20x28	69	210	83.3	2520	145,000	189,000	29,000
6	Lehigh Valley	1901	Baldwin	28x26	72	200	71.2	2708	138,400	191,800	28,000x
7	Phila. & Reading	1906	Baldwin	21x26	68½	200	85.5	2375	151,000	196,100	28,450
8	Lehigh Valley	1904	Baldwin	21x28	68½	205	85	3282	155,200	199,300	31,500
9	Del., Lack. & West.	1905	Am. Loco. Co.	22½x26	69	215	94.8	3378	154,000	201,000	35,100
10	Del., Lack. & West.	1907	Am. Loco. Co.	22½x26	73	215	103.8	3467	156,000	209,000	32,970
11	Phila. & Reading	1905	Baldwin	22x26	68½	205	90	2942	169,800	213,500	34,540
12	Cent. R. R. of N. J.	1918	Baldwin	23x28	69	220	91.4	2306 477*	170,800	225,600	40,100
13	Phila. & Reading	1911	Ry. Co. (3)	19x24	74	240	90	2983	172,600	226,750	35,830

* Superheating Surface.
x Working Compound.



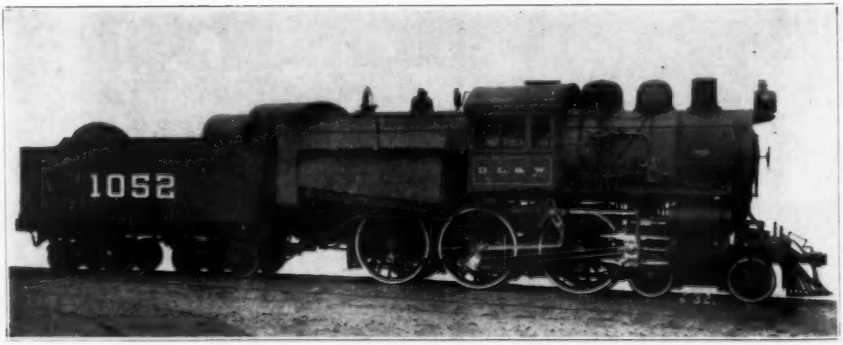
—Courtesy of Geo. M. Hart.

Reading 3-cylinder Locomotive, class L10a, as originally built at Reading Shops in 1911.



Courtesy of Baldwin Locomotive Works.

L. V. #1685. Baldwin—1904. J-55.



—Courtesy of American Locomotive Co.

D. L. & W. #1052. A. L. Co. 1907.

TABLE IV—ADDENDA

2. Designed for suburban express service.
6. Vauclain four-cylinder compound; designed to haul 400-ton passenger train from Mauch Chunk to Glen Summit Springs, 33.7 miles, at average speed of 30 miles an hour. Average grade about 35 feet per mile, maximum 69.
7. Class L-8-a; boiler with combustion chamber.
8. Class J55; used in general road service.
10. Assigned to Buffalo Division; this design also built with 69" drivers for heavy grade service.
11. Class L-7-a; boiler with combustion chamber.
13. Class L-10-a, Road Number 675. Three-cylinder locomotive; rebuilt in 1916 with two cylinders, 22x26", as Engine 676. Boiler with combustion chamber. Nos. 5, 7, 11 and 12, originally used in fast freight service, were subsequently assigned to passenger service.

All the locomotives in this table, except as noted above, had modified Wootten boilers without combustion chambers.

BIBLIOGRAPHY

Records and catalogs of The Baldwin Locomotive Works.

Catalogs of the Brooks Locomotive Works, the Schenectady Locomotive Works, and the American Locomotive Company.

Files of the American Railroad Journal, the Railroad Gazette, and the Railway Review.

Development of the Locomotive Engine, by Angus Sinclair.

The Early Motive Power of the Baltimore & Ohio Railroad, by J. Snowden Bell.

Records of the Pennsylvania Railroad Company and the Reading Company.

Personal recollections of the writer, and the courteous assistance of a number of his friends, especially Charles B. Chaney, M. C. M. Hatch, F. Stewart Graham, Walter Lucas, and George M. Hart.

Editor's Note

Your Editor wishes to call the attention of our members to an error in the date caption of S. P. #3048 that appeared in our Bulletin #62, opposite page 8. The correct date should be 1906.

Also, the table of Atlantic type locomotives on page 12 of the same bulletin, because of lack of space, may not be quite clear to all of our readers. The classes E-1, E-1a, E-2 and E-2a had slide valves, the E-2d had piston valves, the E-3 and E-3a had slide valves and the E-3d had piston valves. In the following line, the above classes that had slide valves used the Stephenson gear and those with piston valves used the Walschaert gear. The page limitations did not permit the dividing line to be drawn at the proper place and this explanation is given to our members to clarify their records and in fairness to the author, whose chart was most carefully and correctly prepared.

The Rochester, New York and Pennsylvania Railroad

By C. F. H. Allen

The decade 1870-1880 saw great activity in the projection and construction of railroads in northwestern Pennsylvania and southwestern New York. This, in considerable part, was accentuated by the discovery of oil in the Bradford-Wellsville district. Since this area forms a part of the foothills of the Allegheny Mountains, most of the roads were of necessity neither level nor straight, and, as was so often true of pioneer construction, practically all were built to a 3 ft. gauge. One of the earlier ones was

(1) The Rochester, Nunda & Pennsylvania Railroad Co., which was organized on Apr. 9, 1870. The termini of this 32-mile New York road were Mt. Morris and a point (now Belmont) in Amity township with connections planned which would reach the coal and oil fields of Pennsylvania. The towns along the proposed route were appealed to for help; Birdsall was bonded for $20,000, and Angelica for $65,000. This company expended $100,000, but did no construction work.

(2) On Jan. 10, 1872, the Rochester, Nunda & Pennsylvania Extension Railroad Co. was organized to construct a road from Amity to a point upon the southern line of the state near Mill Grove (now Portville) in Cattaraugus County; Mill Grove was the southern terminus of the 113-mile long Genesee Valley Canal, which had been constructed from Rochester but was abandoned in 1878. (The canal bed was utilized for the Genesee Valley Canal Railroad which became the Western New York and Pennsylvania, and at the present time is a branch of the Pennsylvania, and operated for freight only).

(3) Two days later, the Northern Extension of the Rochester, Nunda and Pennsylvania Railroad Co. was organized, with the object of constructing and operating a road from Mt. Morris to Rochester.

(4) These three corporations were merged into The Rochester, Nunda and Pennsylvania Railroad Co. on May 17, 1872, the line thus extending from Rochester to Mill Grove, all in New York.

(5) In Pennsylvania, the Northern Navigation and Railroad Co. had been organized on Mar. 23, 1867, to build a line from Reynoldsville (an important coal district) to Mill Grove. The Act of Incorporation specified that it extended from the Penn.-N. Y. line in McKean County to the southern border of Elk County.

(6) On Mar. 31, 1873, this was consolidated with (4) to form the Rochester, Nunda & Pennsylvania Railroad Co. A continuous line was projected, passing through Monroe, Livingston, Allegany and Cattaraugus Counties in New York, and through McKean, Elk, Cameron, Jefferson and Clearfield Counties in Pennsylvania, terminating at Brookville. This company executed 7% bonds to the amount of $4,050,000 and had previously secured stock subscriptions of $1,085,000; $645,000

of which came from towns and cities. Work was commenced, and by the end of 1875, $853,900 had been expended; 20 miles of track had been laid, but beyond the use of a construction train consisting of one locomotive and six cars there was no operation.* In order to insure traffic for the road, about 5,000 acres of coal and timber land in Pennsylvania was purchased on Dec. 25, 1873, by its president, Alfred Lockhart. Owing to a depressed condition of business, the bonds did not meet with a ready sale. Under a decree of foreclosure of the mortgage held by the Union Trust Co., on that portion of the road in New York (the part in Pennsylvania was declared to be of no value) the property rights and franchises were sold at Nunda on Mar. 7, 1877, to George Jerome, Franklin D. Lake and Charles W. Leavitt of Nunda, representing the bondholders, for $5,000.

(7) Upon Jun. 27, 1877, it was reorganized as the Rochester, Nunda & Pittsburgh Railroad Co. At this time the grading of the road from Mt. Morris to Belvidere had been largely finished, but otherwise progress seems to have languished.

(8) The Rochester, New York and Pennsylvania Railroad Co. was incorporated in 1880 to build a line from Mt. Morris to Ross Jct., a point on the New York, Lake Erie and Western Railway (later a part of the Erie).

(9) On Jul. 11, 1881, this was consolidated with (7) to form a new road under the name The Rochester, New York and Pennsylvania Rail Road Co. It was again planned to construct from Rochester to the state line in Portville.

The disposition of this line is not certain, for there is disagreement between different authorities. Both versions will be considered.

(A) This road, and its 8 antecedents, are considered by the Pittsburg, Shawmut and Northern Railway to be its predecessors. In its Corporate History, it is stated that on Oct. 21, 1881, the 23.5 miles of narrow gauge road between Friendship and Swains, the property rights, franchise, etc., were sold to the Allegany Central Rail Road Co. (No. 1) for $25,000. It seems to cover the present route of the Pittsburg, Shawmut and Northern—there is no doubt that this railroad has the right of way at present. Such a transaction is not mentioned in any of the Poor's Indexes.

(B) In several issues of Poor's, it is recorded that the Rochester, New York and Pennsylvania was chartered on July 7, 1881, and e.g. (p. 114, 1882), "Leased to the Buffalo, New York and Philadelphia Railway since the close of the fiscal year." The next year (p. 312, 1883) it states that the BNY&P owns all the capital stock of the RNY&P, and the line is leased to the BNY&P. It gives the mileage as 11.75, which is the distance from Swains to Nunda Jct., and in 1884 (p. 136) it was

---

*There is some disagreement in the actual amount of money used. Poor's 1876-7 Index gives $862,900 to Sept. 30, 1875, but in the next volume (1877-8) it is down to $853,900! "A Centennial Memorial History. Allegany and Its People," (published in 1896) states that $925,000 had been paid, $525,000 in cash from subscriptions and $400,000 in stock of the company taken at par by the contractors for work done and material furnished.

redefined in the same way, with the addition that it had been rebuilt (to standard gauge) in 1882.

This 11.75 mile portion was leased by the BNY&P to the Lackawanna and Pittsburg (No. 2; a predecessor of the Pittsburg, Shawmut and Northern) who also used the track of the BNY&P from Lackawanna Jct. to New Castle, Pa. "The main line (207 mi.) of this road (L&P) from New Castle to Perkinsville is just being opened for business in connection with the New York, Lackawanna and Western" (now DL&W). This is the nearest that the ideal of the first Rochester, Nunda and Pennsylvania ever came to fruition. This lease was automatically terminated in 1890 by the failure of the Lackawanna and Southwestern (successor of the L&P) to operate trains over it (see Bulletin No. 61, p. 80). All this is duplicated in the 1886 Index (p. 190).

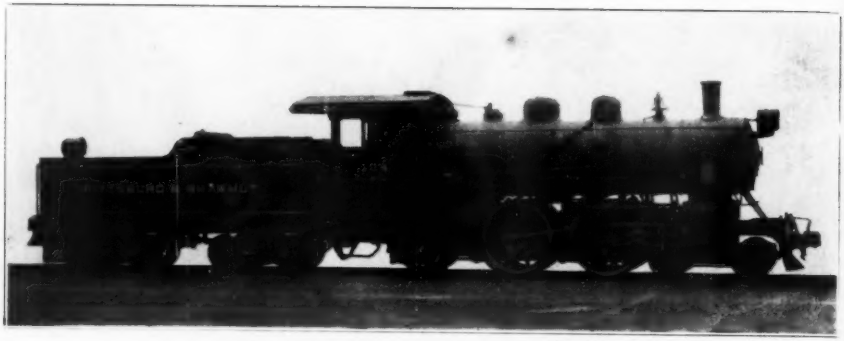
In later issues, the RNY&P is leased to the Western New York and Pennsylvania (the successor of the BNY&P), who own all the capital stock, and who finally acquired ownership on Feb. 28, 1916. This version is accepted by Norman J. Perrin in his pamphlet on the Western New York and Pennsylvania Railway.

At some date between 1908 and 1916, the 11.75 miles from Swains to Nunda Jct. were mostly torn up. At present, only 2.36 miles from Nunda Jct. to Nunda is in operation. This is a branch of the present Rochester branch of the Pennsylvania Railroad. There is no doubt that the Pennsylvania or its predecessors owned this portion.

The simplest way to reconcile the facts and claims is to assume that both are correct, but do not refer to the same portions of the RNY&P.

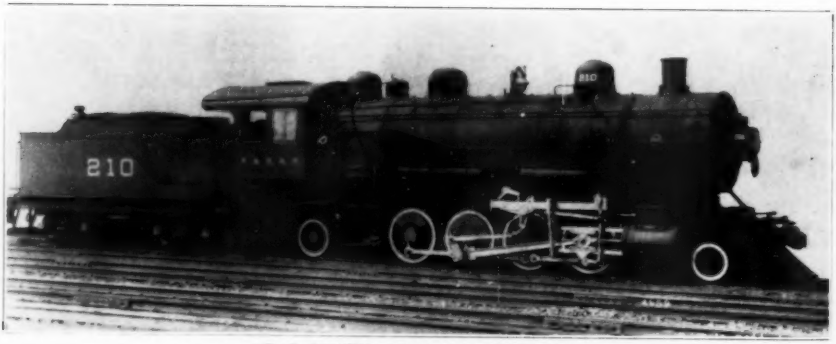
ACKNOWLEDGMENT

I am greatly indebted to Mr. F. H. Wells, the General Freight Agent of the Pittsburg, Shawmut and Northern, for permission to examine the Corporate History of the road, and for other helpful comments.



—Courtesy of American Locomotive Co.

P. & S. #104. A. L. Co. #61954—1920.



P. & S. #210. Baldwin #4066—1913.

Notes on The Pittsburg, Shawmut and Northern Railroad Company

By C. F. H. Allen

The Pittsburg, Shawmut and Northern Railroad, the immediate predecessors and the latter's predecessors, totaled 32 different corporations. Of these, 22 did not construct any completed road, though some of them began work. With the exception of the Rochester, New York and Pennsylvania Rail Road Co., and its predecessors, which is treated as a separate unit, the others are most easily followed as a Table, which appears herewith. This table also includes the lines leased subsequently. No account is really complete without the details of the part the Interior Construction Company played in arranging the consolidations; this history of the corporate financing is taken from the Interstate Commerce Commission Valuation Docket No. 901, pp. 30-31.

History of Corporate Financing

"The carrier upon its incorporation on August 2, 1899, assumed the obligation of a predecessor company, The Central New York and Western Railroad Company (of 1892), resulting from a contract dated April 19, 1899, made between such predecessor company and the Interior Construction & Improvement Company. The last-named company was at this time promoted by individuals owning or controlling the entire capital stock of The Central New York and Western Railroad Company (of 1892).

"Under the contract of April 19, 1899, the Interior Construction & Improvement Company agreed to cause the incorporation of The Central New York and Northern Railroad Company, to acquire all outstanding capital stock of The Smethport and Olean Railroad Company, the Buffalo, St. Mary's and Southwestern Railroad, The Mt. Jewett, Clermont and Northern Railroad Company, and the Clarion River Railway, and, thereafter, through consolidations, to transfer the properties, rights, and franchises of these five companies, together with those of The Central New York and Western Railroad Company (of 1892), to a new company to be incorporated under the name of the carrier. The railroad property to be thus vested in the carrier aggregated about 119 miles, of which 101 miles were standard gage and 18 miles were narrow gage, and, in addition, about 28 miles of road from which the rail had been removed.

"The Interior Construction & Improvement Company further agreed to change the gauge of the above-mentioned 18 miles of road from narrow to standard; to construct extensions so that the total mileage would aggregate about 230 miles; to make certain line changes and perform considerable reconstruction; to construct additional sidetracks and make other improvements; to provide 1,100 new freight cars and 10 new locomotives; to retire the outstanding mortgage bonds and other liabilities of the companies to be consolidated; and to develop the mining property of the Shawmut Mining Company and acquire that company's entire capital stock for the carrier; all the above undertakings to be performed by October, 1900.

"In consideration for the above, the carrier was to deliver $12,000,000 par value of its capital stock and $6,000,000 par value of its first-mortgage 5 per cent bonds to the Interior Construction & Improvement Company.

"The Interior Construction & Improvement Company, upon receiving $5,570,000 par value of stock and $6,000,000 par value of bonds from the carrier transferred them to Henry Marquand & Company in settlement for advances made and to be made by that company. But Henry Marquand & Company failed in 1901, leav-

ing the Interior Construction & Improvement Company without means of securing additional funds for the construction required under the contract.

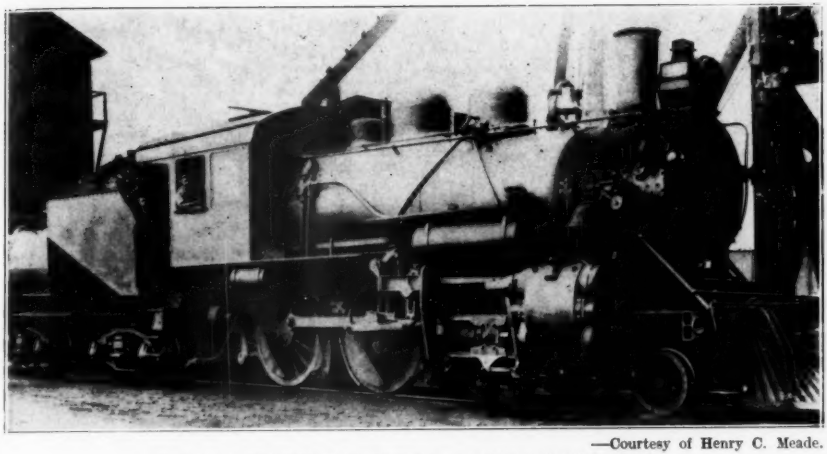
"As the result of the above, a new contract was executed on December 31, 1902, wherein the Interior Construction & Improvement Company was authorized to construct about 12 miles of additional branch line and, on the other hand, was relieved from constructing about 11 miles of main line previously authorized, and it was authorized to acquire and develop mining property for the Kersey Mining Company, whose entire capital stock was to be acquired and transferred to the carrier. The amount of bonds of the carrier to be issued was increased from $6,000,000 to $11,400,000 par value. An additional amount of bonds was to be issued in case additional mining property or additional lands were provided.

"The Interior Construction & Improvement Company continued construction until July, 1904, through advances received from T. H. Hubbard & Company. It was unable to repay these advances, which were eventually canceled through forfeiting to T. H. Hubbard & Company $9,430,000 par value of capital stock and $7,375,000 par value of bonds, which securities had been received from the carrier and pledged as security for the advances. No further work under the contract was performed after 1904.

"On the other hand, the Interior Construction & Improvement Company effected the incorporation of the carrier, as required by the Contract of April 19, 1899, except that The Mill Creek Valley Railroad Company, not mentioned in the contract, was included in the consolidation in place of the Clarion River Railway, which was intended to be consolidated but was not so included. The Interior Construction & Improvement Company also acquired and retired all outstanding securities and liabilities of the consolidating companies. It also changed the gauge of about 18 miles of road from narrow to standard, it constructed about 24 miles of new standard-gauge road, it constructed about 23 miles of standard-gauge road on an old narrow-gauge roadbed from which the rail had been removed, it performed extensive reconstruction and made many improvements, and it provided new equipment, all for the carrier. It also constructed about 2 miles of road under the charter of The Shawmut Connecting Railroad Company, which it had organized, and it caused this company to transfer its property, through merger, to the carrier. It acquired the entire capital stocks, which were delivered to the carrier, of the Clarion River Railway, the Kersey Railroad, the Shawmut Mining Company, the Kersey Mining Company, and the Shawmut Commercial Company. It reconstructed the 12 miles of road owned by the Clarion River Railway, constructed about 10 miles of road for the Kersey Railroad, and acquired and developed mining property for the Shawmut Mining Company and the Kersey Mining Company. It acquired the entire capital stock of the Shawmut Coal and Coke Company, which stock was transferred to the Shawmut Mining Company.

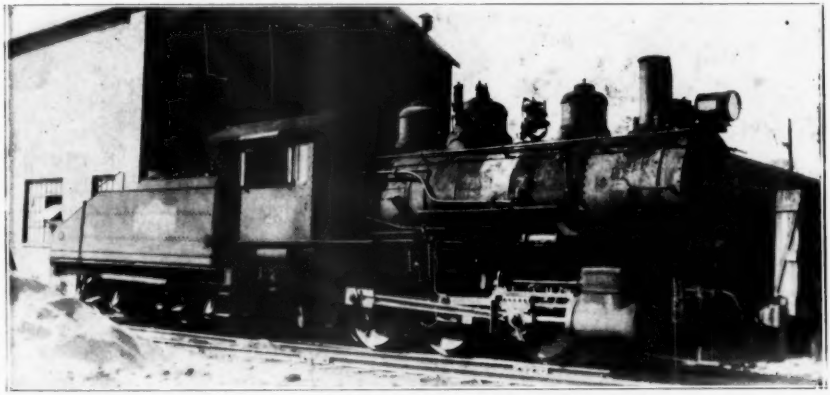
"All things mentioned in the preceding paragraph were performed by the Interior Construction & Improvement Company for the carrier and in consideration for the $28,375,000 par value of securities received from that company. It received no considerations from any of the other companies mentioned above, except the capital stocks of the Kersey Railroad and the Kersey Mining Company, which companies it had organized, and it immediately transferred such securities to the carrier."

All construction after the consolidation was done by the new company, i.e., PS&N. By the end of 1901, the 18 miles of narrow gauge between Olean and Bolivar was changed to standard width and 15 miles built between Marvindale and Coryville. The PS&N roadbed coincides with the old Bradford, Eldred and Cuba 3 ft. gauge roadbed for a distance of about 2.6 miles between Bolivar, N. Y., and near Bullis Mills, Pa., mostly in the vicinity of the N. Y.-Pa. state line. The balance of the distance the old line is parallel but isolated. From State Line to West Eldred the old line is entirely isolated from the present line. By the end of 1904, the extension of 7.6 miles from Kasson to Clermont, in-



—Courtesy of Henry C. Meade.

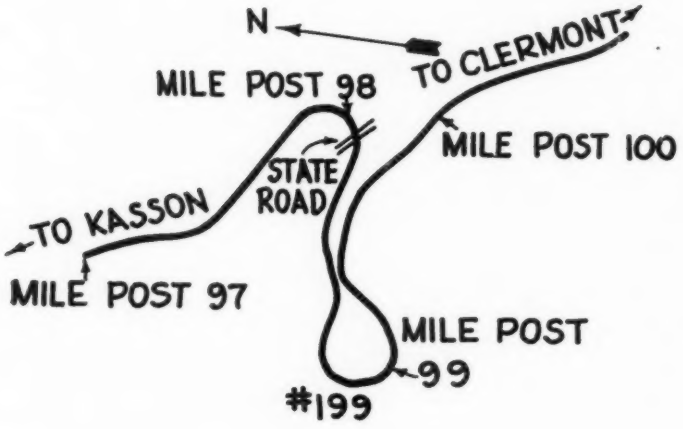
P. S. & N. 2nd #15 at St. Mary's, Pa. Baldwin #41015—1913.



P. S. & N. #23 at St. Mary's, Pa. Baldwin #25712—1905.

P. S. & N. #62 at St. Mary's, Pa. Baldwin #32769—1908.

KASSON LOOP


N
TO CLERMONT
MILE POST 98
MILE POST 100
STATE ROAD
TO KASSON
MILE POST 97
MILE POST 99
#199

cluding the famous Kasson Loop had been constructed, and the gap between Angelica and Bolivar (23.2 miles), using the old roadbed of the Allegany Central had been closed. The road is now laid with 85 lb. rail.

In the name, Pittsburg is spelled without the final "h" of the city it does not reach. The word "Shawmut" is an old Indian name, which at once suggests the Shawmut tribe of Indians who formerly lived in the vicinity of Boston, Mass. It seems highly probable that a portion of the funds used came from Boston financial interests (also see under Pittsburg & Shawmut).

One or two other notes may be added to the paper in Bulletin 61, p. 76. The second Lackawanna & Pittsburgh was the company that did the construction. The right-of-way between Angelica and Rockville, from which the track was torn up in 1890, is still held by the PS&N. By the end of 1884, the L&P had trackage rights extending down into Penna. over the Buffalo, New York and Philadelphia of 207 miles. Perhaps this was an instance of over-expansion for it is noted in December, 1884, that "the company becoming embarrassed" the road was placed in the hands of receivers. By the end of 1885 it is noted that plans had been made for a reorganization as the Western New York and Southwestern, and that these had the approval of 60% of the stockholders. At this time the road owned 4 locomotives and 158 cars. In 1887 an extension to Geneva was planned. Apparently the reorganization failed to go through, for on April 27, 1889, the railroad was sold under foreclosure, and the company reorganized on May 7th as the Lackawanna and Southwestern Railroad Co. Without a change in the name it soon added The Rochester, Hornellsville and Lackawanna Railroad by consolidation. It was, thus, the second Lackawanna and Southwestern that was sold to individuals in 1892.

It is also interesting to note that in May, 1899, the stockholders of the Central New York and Western voted to increase the capital stock from one to two million dollars, in order to widen the narrow gauge portions, fill in trestles, relay the road with heavier rail, and to secure new equipment.

On the map accompanying the former article the Clarion River Railway was shown as a detached property, but with the proposed connection with the main line at what is now Kersey indicated as a broken line. An extension from Hallton to Brookville was also contemplated. The PS&N never made an outright purchase of the Clarion River Ry., but operated the property through ownership of the capital stock and under the lease agreement of Aug. 2, 1899. This status continued until the line was sold to the Tionesta Valley in 1926. The piers of the Clarion River Ry. bridge at Carman are still standing, and may be seen from trains on the BR&P.

The Kersey Railroad is not formally leased to the PS&N, but the line has been operated since its completion in 1901 by virtue of ownership of the capital stock. The PS&N maintains the property and pays the taxes, but no rental.

The towns of Richburg (population in 1881, 8000) and Mt. Jewett were formerly very busy places and the source of considerable freight. Although not strictly "ghost towns," they now have a population of about 500. With the exhaustion of the glass sand and depletion of the forests, this line to Mt. Jewett became unprofitable and was torn up. The present piece of track nearest the main street of the town is the former PS&N terminal line to the station. From J&B Jct., it is possible to follow the old roadbed for a considerable distance.

The two highest points on the railroad in New York are near West Notch and Swain's, in Allegany County. West Notch is between Friendship and Richburg. Starting as a large horseshoe, a dirt-filled trestle spanning the Richburg Valley, the line climbs steeply up the West Notch hillside to a height of 1,938 ft. At Swain's another horseshoe sweeps across the valley, attaining a height of 1,778 ft. (From "Peaks of Allegany," the "Angelica Advocate," Angelica, N. Y.)

The Kasson (Palmerville) Loop is a remarkable engineering feat, between Kasson and Clermont in Pennsylvania. The railroad swings around in an enormous double curve, on the sides of several hills, with embankments and continuous ascending grade. The construction was necessary to ascend to the plateau from the long deep valley which extends nearly to Clermont. The railroad starts at grade, 2 miles south of Kasson, near Marvindale and turns easterly; it is built on a shelf cut out of the side of a hill to the north. After about a half mile it loops across the valley on a large fill to a shelf on the hill on the opposite side; it is now headed west. After about 0.3 mile it crosses a small valley and turns south, east, and north in order, all along the side of hills almost in a complete circle; it then again turns east, running on a shelf about fifty feet above its former line but within a stone's throw, and continues on to Clermont. With a sufficiently long train, the front and rear ends are together at this close point so that the train appears to be passing itself. The controlling grade is 1.5% compensated. The elevation at Kasson is 1581.16, at curve No. 199 it is 1866.80, and ½ mile beyond Clermont it is 2132.19.

The reason for this construction is a feature of the geography of this entire section. A huge plateau, roughly triangular in shape, extends from Rock City, N. Y., well down into Pennsylvania. One side extends roughly through Clermont, Mt. Jewett, and Kane. The Buffalo, Rochester and Pittsburgh Ry. ascends by its horseshoe curve at Droney's. The Erie crosses a gash in the plateau by means of its famous 301 ft. high Kinzua viaduct. To the traveler, this plateau is rather striking, for he emerges from the twisting rail line between mountains to an extensive level area of fields and pastures, that continues for miles.

In order that the PS&N descend from Clermont, since the formation prevented further progress, it was necessary to cross the valley to the adjacent hill on the opposite side, or construct a switchback (not considered feasible by the engineers on account of the steep grade). A trestle was out of the picture because it was necessary to descend sharply (250 ft.) during the crossing. The decision was made to build the feature now known as the Kasson Loop. It is entirely constructed

P. S. & N. #74. Baldwin #35992—1911.

—Courtesy of Clayton L. Wise.

P. S. & N. #81, Baldwin #48132—1918. Ex. Erie R. R. #2499.

P. S. & N. #98, Baldwin #30000—1907.

of rock and earth with a single bridge where it crosses the highway. Mr. Randolph Soranson writes that "When it was completed, the management gave a free excursion to employees and businessmen of St. Marys, with suitable ceremonies, afterwards taking them all southwards to the mining town of Byrnedale, where extensive coke ovens had been recently erected and opened for commercial benefits. This latter town is located on a branch line about 14 miles out of St. Marys; the mines at that particular point and coke ovens have been practically abandoned at the present time." The main line of the former Buffalo & Susquehanna and a branch of the Pennsylvania also tap this coal area.

The principal originating traffic is coal. The main coal operations are now at Brandy Camp, and in the Weedville-Tyler district. Other industries on the line include sewer pipe, carbon plants, and tanneries at St. Marys, oil refineries at Bolivar and Farmers Valley, a tile plant at Olean, clay conduit works at Clermont and Drummond, silica gravel at Eldred, and miscellaneous manufactured goods from various points.

Concerning the locomotive roster, the PS&N now (10-11-43) has but 16 engines in service. These are #22 (at Angelica, N. Y.), #23 (at St. Mary's Pa.), #50, 51, 58, 59, 62, 68-75 incl., and #81. The last, #81, class J-2, is a 2-10-0; it is one of the Decapods originally built for the Russian Government, and has tires 7″ wide. It was purchased from the Erie (their number, 2499) in January, 1942. It was built by Baldwin (constr. number, 48132) in 1918; it has 52″ driving wheels and 25x28 cylinders, operates at a boiler pressure of 180 lbs. and has a tractive effort of 51,500 lbs.

The PS&N also had two Brill Motor Cars, Model 75; #90 was purchased in 1925 and #91 the following year. When passenger service was abandoned, the first was sold to the Consolidated Railroad of Cuba (Jan. 1939), and the second to the Thos. F. Carey Co. (1936).

The Class H consolidations were subdivided into H-3 (50-55) and H-4 (56-75), differing in distribution of weight on the drivers. Class B-1 and #50-67 of Class H have Stephenson link motion, while the others have Walschaert valve gear.

The scrapping dates of the engines listed as "in service" on pg. 87 of the roster are as follows: #53, 6-15-41; #55, 12-27-40; #57 is "out of service," but not scrapped; #60, 3-29-40; #61, 3-12-40; #63, 3-22-40; #64, 3-2-40; #66, 3-17-40; #67, 3-9-40. The boiler of No. 45 is still in use as a stationary boiler at the St. Marys shops.

The #98 was too heavy for the light rails and the wheelbase too long for many of the sharp curves. It was used mainly on the Byrnedale branch and was stored for years before being scrapped.

ACKNOWLEDGMENT

The author takes pleasure in acknowledging the considerable assistance of Mr. F. H. Wells, the present General Freight Agent, and of Mr. Randolph Soranson, a former employee, both of St. Marys, Pennsylvania, and to Mr. F. E. Gerg for the locomotive data.

CHART OF THE CORPORATIONS MAKING UP THE PITTSBURG, SHAWMUT & NORTHERN R. R. CO.

1. The Rochester, New York & Pennsylvania Railroad Co.,* on 10-21-1881 sold 23.5 miles to (4).
2. The Olean Rail Road Co.* Chartered 5-10-1881. Consolidated with (3) and (4) to form (5).
3. The Friendship Rail Road Co.* Chartered 9-29-1881. Consolidated with (2) and (4) to form (5).
4. The Allegany Central Rail Road Co. (No. 1) "Articles of Association"—9-29-1881. Consolidated with (2) and (3) to form (5).
5. The Allegany Central Railroad Co.* (No. 2) Chartered 11-21-1881. Formed by the consolidation of (2), (3), and (4). Consolidated with (6) to form (7).
6. The Lackawanna & Pittsburgh Railroad Co. Incorporated 11-21-1882. Consolidated with (5) on 6-1-1883 to form (7).
7. The Lackawanna & Pittsburgh Railroad Co.* Formed by the consolidation of (5) and (6). Leased the Swain's branch from the B. N. Y. & P. Sold under foreclosure, 4-27-1889; reorganized 5-7-1889 as (9).
8. The Rochester, Hornellsville & Lackawanna Railroad Co.* Incorporated 6-9-1886, consolidated with (9).
9. The Lackawanna & Southwestern Railroad Co. Consolidated with (8) on 10-2-1889, sold under foreclosure and divided 9-24-1892, into (10) and (11).
10. This portion of (9), formerly the R. H. & L. was sold to Charles Adsit and John Taylor Gouse, who in turn conveyed it to John Byrne and Frank Sullivan Smith; Smith purchased Byrne's share from his estate in 1914 and on his decease it came to his widow and upon her demise it was willed to the AMERICAN RED CROSS. On 8-1-1899 it was leased to (100).
11. This portion of (9), formerly the L. & P., was sold to John Byrne, who conveyed it (11-19-1892) to (12).
12. The Central New York & Western Railroad Co. Chartered 11-18-1892. Consisted of (11) and operated the R. H. & L. "as owned" or "under contract." Consolidated with (13) on 8-1-1899 and consolidation with (100) arranged by Interior Construction Co.'s contract of 4-19-1899.
13. The Central New York & Northern Railroad Co. Organized 4-20-1899, consolidated with (12) on 8-1-1899.
14. The Mt. Jewett & Smethport Railroad Co.* Incorporated 5-27-1892. Consolidated with (15) to form (16).
15. The Emporium & Mt. Jewett Railroad Co. Incorporated 10-28-1895. Consolidated with (14) to form (16).
16. The Mt. Jewett, Clermont & Northern Railroad Co. A consolidation of (14) and (15) on 5-26-1897. Consolidated with (19), (20) and (21) to form (28).
17. St. Marys & Southwestern Railroad Co.* Incorporated 6-19-1893. Consolidated with (18) to form (19).
18. Buffalo & St. Marys Railroad Co.* Incorporated 6-5-1895. Consolidated with (17) to form (19).

19. Buffalo, St. Marys & Southwestern Railroad Co.
A consolidation of (17) and (18) on 1-29-1897. Consolidated with (16), (20) and (21) to form (28).

20. The Smethport & Olean Railroad Co.
Incorporated 12-5-1895. Consolidated with (16), (19) and (21) to form (28).

21. The Mill Creek Valley Railroad Co.
Incorporated 6-13-1899. Consolidated with (16), (19) and (20) to form (28).

22. Clarion River Railway Co.*#
Chartered 12-17-1889, a detached property. Owned by (100).

23. Kersey Railroad Co.*#
Chartered 3-13-1900. Owned by (100).

24. The Shawmut Connecting Railroad Co.*
Organized 8-1-1900, merged with (100) on 1-20-1905.

25. Brookville & Mahoning Railroad Co.*
Incorporated 7-21-1903, name changed to (26) on 8-28-1909.

26. Pittsburg & Shawmut Railroad Co.*
(25) renamed. Name changed to (27) on 1-3-1910.

27. The Pittsburg & Shawmut Railroad Co.*
Leased from 1908-1916 to (100).

28. The Pittsburg, Shawmut & Northern Railroad Co.
Chartered 8-1-1899. A consolidation of (16), (19), (20) and (21).

29. The Interior Construction Co.
See text for contract of 4-19-1899.

100. The Pittsburgh, Shawmut & Northern Railroad Co.*
Incorporated under the laws of New York and Pennsylvania, 8-2-1899. Formed by consolidation or lease of (10), (12), (22), (23), (24) and (28) and leased (27) from 1908-1916.

---

* These companies did construction work.
# The entire capital stock of these companies was owned by the P. S. & N. (100).

The Pittsburg & Shawmut Railroad Co.

By C. F. H. Allen

No account of the Pittsburg, Shawmut and Northern Railroad is complete without a consideration of the Pittsburg & Shawmut, leased from 1908 to 1916. The Pittsburg & Shawmut extends from a point called Erie Jct., the southern end of PS&N operations near Brockway, to Freeport, 26 miles north of Pittsburgh. At one time it was hoped that the combination of the two lines would secure traffic between the Pittsburgh district and Lake Ontario, but the line was situated less favorably than the Buffalo, Rochester & Pittsburgh, contemplated construction was never completed, and financial troubles diverted them. Since the termination of the lease in 1916, the Pittsburg & Shawmut has been operated independently and successfully—it is a Class I railroad.

The history is relatively uneventful. The Brookville and Mahoning Railroad Co. was incorporated on July 21, 1903, under the laws of Pennsylvania, to build a standard gauge railroad from Erie Jct. to Freeport, and the first six miles were opened in April, 1907. Construction continued regularly, 29 miles being in operation by February, 1908, and 35 miles in 1909, comprising the lines Erie Jct. to Colon, Colon to Ramsaytown, and Colon to Knoxdale. However, the terminus at Freeport was not reached until 1918.

The name was changed to the Pittsburg and Shawmut Railroad Co. on Aug. 28, 1909, and to the present title on Jan. 3, 1910. The reason for the change appears to have been the desire to avoid confusion of initials with the Boston and Maine Railroad. This possibility would seem especially liable to occur to any Boston backers; the latter were also probably responsible for the retention of "Shawmut" in the name. The confusion arising from the similarity between Pittsburg and Shawmut, and Pittsburg, Shawmut and Northern, did not seem to impress them.

The line was leased to the PS&N in 1908, who operated it until the lease was abrogated by the P&S in 1916. The P&S still owns over $12,000,000 worth of PS&N bonds. The main offices are at Kittanning, and the shops are at Brookville. In 1924, the equipment was listed as 25 locomotives and 2398 cars (of which 2343 were coal). By 1941, the locomotives had decreased to 17 as shown in the roster.

The mileage, including branches, is 103. It is laid with 85 lb. rail. There are five tunnels in the line. The principal architectural feature is the 1123 ft. bridge over the Allegheny River. At one time an extension of track to connect with the Bessemer and Lake Erie RR. was considered, but, fortunately, such an expansion was not realized.

At present the P&S is operated for freight only. The principal commodity handled is soft coal; this originates in 23 mines on the line—it is of a quality that is in great demand. There are lesser amounts of mineral products derived from valuable clay deposits, and limestone required by the iron and steel industry.

In 1934 there was one passenger train daily between Timblin and Glen Irwin, and Brockway and Timblin, and one on the branch Norman to Conifer. There was also a train north each morning from Furnace Run to Glen Irwin, but, from the scheduled time, the southbound equivalent must have been a mixed train (it required 6½ hrs. to cover 18 miles)! Service on the Seminole and Chickasaw branches was listed as "Intermittent" in 1934.

The Pittsburg and Shawmut connects with the Erie and with the Pittsburg, Shawmut and Northern at Erie Jct., with the Pennsylvania at Brookville and Freeport Jct., and with the Baltimore and Ohio at Dellwood and at Bridgeburg (West Mosgrove). Since the two tracks at the latter point are at greatly different levels, travelers debarking from the P&S, when a passenger service was maintained, had to climb a long flight of stairs to reach the B&O.

According to Poor's Manual of Railroads, on Dec. 8, 1915, it was reported that a committee had been formed to effect a consolidation of the Pittsburg and Shawmut with the Pittsburg, Shawmut and Northern, its aim being to take the latter road out of receivership (it is still not out—this is the longest receivership on record) and place both properties on a sound financial footing. Nothing seems to have been done; had this consolidation gone through it would have been of considerable advantage to the PS&N.

PITTSBURGH & SHAWMUT RAILROAD LOCOMOTIVE ROSTER

All Class H and J locomotives were built by Baldwin, have 51" drivers, 22x28 cyl. and a tractive force of 45170 lbs. with 200 lbs boiler pressure. The 2 Class E-1-S were built by American Locomotive Co.; and had 69" drivers, 19x26 cyls. and a tractive force of 23100 lbs. at 200 lb. boiler pressure. All the Baldwin-built locomotives of the Pittsburg and Shawmut Railroad were purchased for that road during the time it was operated by the Pittsburg, Shawmut and Northern. They were always classed separately and have the same numbers now as they had when purchased.

RR. Number	Class	Wheel Arr.	Builder's Number	Year Built	Remarks
104	E-1-S	4-4-2	61954	1920	Sc. Nov. 1938
105	E-1-S	4-4-2	61955	1920	Sc. Nov. 1938
200	J	2-8-2	36821	1911	In service
201	J	2-8-2	36822	1911	Sc. Nov. 1938
202	J	2-8-2	40589	1913	In service
203	J	2-8-2	40590	1913	In service
204	J	2-8-2	40591	1913	In service
205	J	2-8-2	40592	1913	Sc. Nov. 1938
206	J	2-8-2	40612	1913	In service
207	J	2-8-2	40613	1913	In service
208	J	2-8-2	40614	1913	In service
209	J	2-8-2	40615	1913	In service
210	J	2-8-2	40616	1913	In service
211	J	2-8-2	40617	1913	Sc. Nov. 1938
212	J1	2-8-2	41563	1914	In service
213	J1	2-8-2	41564	1914	In service
214	J1	2-8-2	41565	1914	In service
215	J1	2-8-2	41566	1914	In service
216	J1	2-8-2	41567	1914	In service
217	J1	2-8-2	41568	1914	In service
226	H	2-8-0	36817	1911	In service
227	H	2-8-0	36818	1911	Sc. Nov. 1942
228	H	2-8-0	36819	1911	Sc. Dec. 1940
229	H	2-8-0	36820	1911	Sc. Nov. 1938

ACKNOWLEDGMENTS

The author takes pleasure in acknowledging the valuable assistance of E. J. Halbert, President, Roy M. Gidel, Secretary, and E. L. Frazier, Jr., Master Mechanic, of the Pittsburg and Shawmut Railroad.

Financing Super-Railroads

By John W. Barriger, III

A talk delivered before the Chicago chapter of The Railway Locomotive and Historical Society at Chicago, Oct. 8, 1943.

The goal of every business executive is to operate at capacity with selling prices so adjusted to costs as to produce earning power that represents an adequate return upon the capital which created the enterprise. The railways as a whole have seldom been in that enviable position—or remained in it for long when such circumstances temporarily occurred. The industrial and military activity of a global war effort and this conflict's interference with competitive transportation agencies have created extraordinary demands for rail service, which when fulfilled in 1942 and 1943 represented the greatest number of transportation units ever produced within equal periods of time.

Railroad management has proved that it has the resourcefulness and the railway plant has the capacity to move traffic that is triple the depression lows and 50% greater than past peaks. This huge increase has been performed with moderate proportional increases in train miles and expenses.

A return to peace will remove many of the factors contributing to the present volume of business and at the same time will restore the competition of air, water, and highway services, all of which agencies will have been improved and expanded by the war. The principal component of its industrial effort has been the production of great numbers of improved ships, planes, and automotive vehicles, both for fighting and transport purposes in each case. The "New York Times" recently reported that 1944 plane production, for example, would represent an expenditure of 40 billion dollars, nearly double the investment in the railroads after a century of development. The largest planes now are propelled by 8000 H. P. of motor capacity; the largest locomotives produce only 6000 H. P.

After the war, the railroads will be confronted by intensified competition from these other agencies of transport. This may be the more serious to the former because all of the latter, except pipe lines, lend themselves to integration into programs of public works which will doubtless be utilized extensively to relieve any unemployment which may follow demobilization of the armed forces and the transition of wartime economy and organization into an industrial structure designed to fulfill our national aspiration for a continually advancing standard of living.

The railroads are now geared to maximum output. One may assume that it is their determination to minimize traffic declines after the war through application of sound commercial principles of service and pricing in order that these carriers will at all times perform the substantial majority proportion of the nation's common carrier services.

During postwar years of high levels of business activity, which all hope will prevail and not be the exception, the railroads should surpass even present records of volume of service performed. The railroads can always obtain their necessary share of the total business if their freight and passenger schedules are sufficiently fast and their selling prices; i.e., rates, are competitively attractive. The postwar problem is wholly one of running freight and passenger trains on faster overall schedules and producing service at lower cost per unit. The basic factors in successful railway operation will continue to be speed and train load. If both can be advanced sufficiently, the competitive position of the railroads will be secure.

Accomplishing these objectives are technical matters of plant development and operation. The records of recent years—whether of the 30's or of the 40's—is proof positive of the versatility of railroad management in improving service, reducing expenses, and adjusting operations to traffic volume, whether high or low.

The present railroad plant and equipment is a tribute to the ingenuity of the engineering, operating and financial skill of the management and the best parts of it are fully adequate to the necessities which lie ahead. Unfortunately too small a part of the whole embodies the highest standards. The standard of development of all primary main lines and all of the equipment of the trains which run on them must be brought up to the best. The attainment of this goal is the railroads' problem of the future. The difficulties are wholly financial ones. The technical progress has already been made to permit operation on the required speed and cost basis as soon as the entire railway plant and stock of equipment can become completely representative of its highest achievements.

In October, 1941, you gave me the privilege of this platform to outline my views on "super-railroads." I stated that they were necessary because in near future years railroads would be confronted with "super-liners," both aerial and marine, "super-highways," "super-power" and "super-pipe lines." "Super-railroads" alone could meet such competition. I describe "super-railroads" as routes which had been intensively developed physically and supplied with motive power of such high capacity that maximum size freight and passenger trains could cross entire engine districts without consequential intermediate speed restrictions due to adverse physical characteristics or inadequacies of the standard of development of track, bridges, and all related facilities.

"Super-railroads" would embody the very highest and most ultra-modern standards of physical characteristics, i.e., grades, curves, rail distance versus air line distance between intermediate points determining the route, standards of design of tracks, bridges, signals, switching and communications facilities, freight, passenger, and engine terminals, equipment and every other feature of the railroad plant. These must be generally utilized throughout the primary main line mileage of the United States in order that freight and passenger schedules may be

further speeded up, while train carrying capacities are notably increased to effect substantial further reductions in operating costs. Quicker freight and passenger services probably need not be sought through materially higher maximum velocities than those now attained by the fastest trains of both services, but all intermediate speed restricting conditions must be banished, and delays due to meeting and passing trains greatly reduced in order that the average operating rate of through freight and passenger trains, over entire engine districts will closely approach the maximum one permissible. Grades on principal lines, except on mountain crossings, must also be reduced to such easy ascents that these maximum speeds can be continuously maintained by 1,200 ton passenger trains and 6,000 ton freight trains. Only in this way can future rates and fares produce the high train mile earnings which alone will permit the property improvement necessary to hold and develop traffic in the face of the bitter rivalry of competitive transportation agencies which will surely have been improved, strengthened and multiplied by the industrial development caused by this war.

The basic reason for building railroads is to provide superior means of overcoming friction and gravity which are the two principal natural forces opposing movement of vehicles in inland transportation. Efficient railway operation depends upon reducing the magnitude of these resistances to the minima economically justifiable and then producing with the greatest possible efficiency, the tractive forces necessary to overcome them and applying this hauling power with maximum effectiveness. The principal component of operating expense being the train mile, it has followed that the underlying principle of successful railway management has been to produce all of the transportation required in a minimum number of these units. Direct lines, with low grades, minimum total curvature and all curves of long radius, track and structures designed to the standard needed to carry maximum loads at maximum speeds with complete safety and minimum maintenance costs, comprise this fundamental factor in railway economics. The second is locomotives of appropriate horsepower and superior fuel and maintenance economy. The third is the adequacy of route and yard capacity and appurtenant facilities of all kinds which together permit trains to be operated continuously at the maximum speeds possible for the heavier standard of train load and enable all terminal services, for trains and engines, to be performed expeditiously and economically. Fourth, are the similar considerations concerning car design and construction. In the future the economies which can be obtained from very large freight cars, more heavily loaded, should be the controlling determinant of their dimensions which probably should closely approach those of modern passenger equipment. Shipper co-operation should be sought by rate-making practices which will share the resultant operating savings with the patrons who help obtain them. This will provide the most practical encouragement to efficient car utilization and remove the tendencies of sharp competitive stress to decrease car loads. Containers offer the means of reconciling the wishes of shippers for lesser shipping

units and the transportation requirements which underlie more economical operation. Further development of the container should also be sought to lessen the expense of packing for shipment by rail.

The somewhat indefinite term "appropriate horsepower," which has just been used in reference to locomotives, may be defined as the locomotive of the smallest horsepower necessary to move in single engine trains, an average day's traffic based on minimum frequency of dispatching and the operating speeds required by competitive conditions. The theoretically desirable "appropriate horsepower" for moving all traffic on minimum frequency could, for heavy tonnage or heavy grades, require an engine of impossible size and the upper limit must of course be established by such practical considerations as clearances, bridge and curve limitations, allowable drawbar pull which can be transmitted by the draft gear and couplers, the length of sidings on single track lines, the maximum length train which can be safely controlled by the conventional air brake equipment and the size of turntables, enginehouse and shops.

Grades and curves are a principal ingredient of the railway problem because these introduce the increases in the operating costs and the speed limitations which together make railroad traffic vulnerable to external competition. While grades and curves, like death and taxes, will always remain, the more they can be reduced, the fewer difficulties the railway will have. In the long run, it is preferable to reduce, or eliminate, grades and curves, where economically feasible to do so and thus remove for all time the additional resistances which they interpose against train movement than it is to ease the burden of these handicaps by massing greater (locomotive) forces to combat them; as important as it is to do that when traffic lacks the density necessary to justify the invariably greater capital cost of the former superior alternative. The elimination of adverse physical characteristics on heavy traffic routes followed by the use on such lines of super-power locomotives of maximum capacity, is the most effective method of securing low cost operations, provided, of course, that the capital expenditures necessary for the former improvement are justifiable and the required funds can be obtained. Low grades and easy curves should not be looked upon as a means of avoiding the necessity of using locomotives of maximum horsepower but as the way to secure maximum train loads and speeds from such engines. It should therefore be the goal of intensive development of primary routes to obtain minimum grades and curves and maximum locomotive power so that the full benefits which each can confer upon future operations will be simultaneously and permanently obtained. Low grades and super-power locomotives are the "Victory" combination for the American railroads.

Railways in this country were generally built to original physical characteristics of 1% grades and 6 degrees curves, or slightly higher, save where favorable topography permitted better ones to be obtained with no important increase in original construction costs. (On mountain lines, much heavier grades and sharper curves were, of course, unavoidable.) In view of the limited capital initially available and the

very light traffic usually in sight at the outset, these route standards were sound practice then, but they entail too heavy expenses now for satisfactory main line operations. The laying of additional tracks on the heavier traffic sections in past years permitted a considerable amount of improvement in profile and alignment but the railways of the United States still have too small a proportion of their primary routes represented by engine districts on which ruling grades are 0.5% or less and curvature and bridge limitations do not introduce frequent restrictions in normal train operating speeds. Within the decade after the present war ends, competition will necessitate such fast and low cost operations that it will be imperative to develop the main lines so that their physical characteristics and facilities will permit 6,000 ton freight trains to be hauled by a single maximum capacity locomotive at average speeds of between 35 and 50 miles per hour, save, of course, over high mountain crossings, which however, must in many cases be materially revised and improved through use of long tunnels.

All component parts of the railway plant and equipment must be synchronized with this speed and weight of freight train operation. This will permit the important passenger carrying lines to step up average speeds sufficiently to permit 70-mile-an-hour schedules between all large cities. Daily transcontinental passenger service may have to be introduced in order to retain the long-haul interline passenger movement through the principal east-west gateways. Competitive factors arising from the diversity of routes have in the past always appeared to be an impossible obstacle to establishing them, but the plan of pooling the Chicago-Florida runs established by several lines a few years ago should point the way to transcontinental trains which immediately after the war can span the nation in 56 hours and in due course might make the run in less than 48 hours.

It has been my great privilege to have been afforded the opportunity to see most of the primary and principal secondary route mileage of the railways of this country. On these trips, I go armed with profiles, track charts and working timetables, in order to permit careful observation of the physical characteristics and operating facilities. I know the railroad plant of this country with sufficient thoroughness to understand fully the magnitude of the work which must be done to obtain the foregoing standards. The present railway plant represents an investment substantially in excess of $20,000,000,000. It will probably involve an expenditure of half again as much to convert these carriers into the intensively developed "mass production" transportation machines which I visualize as "Super-railroads," and ten years will be required for this transformation.

The indicated improvements must proceed rapidly in order to insure sufficient overall progress being made each year to protect railroad traffic from the serious erosion that will inevitably follow any retardation in the rate of advance. Meanwhile, the railroads must strive to gain and continuously hold the public imagination and interest through utilizing technical developments as effectively and as promptly as competitive agencies appear to have done. The operating departments of

any railroad can readily develop the details of plant and equipment improvements which together will produce the service standards and low operating costs essential to hold a proportion of postwar traffic that will represent a volume of business exceeding that of any peace year of the past. The sole obstacle to transforming these projects into actualities is the difficulty of paying for their cost. This matter of securing adequate capital generally has been the entire "railroad problem" of past decades. It follows that the public importance of satisfactory railway earnings largely results from the relationship between earnings and credit and capital. All railroad development is founded upon the latter, and it is wholly dependent upon the two former factors.

Capital is money used for productive purposes and either represents income withheld from present security holders for reinvestment in the property, or is money obtained from new investors upon the credit of the company. Credit, in turn, represents the faith which investors have that money which they entrust to an enterprise will be utilized in a manner that will produce an operating profit out of which reasonable rates of interest or dividends can be regularly paid, while reserves are continuously being provided to restore the service life worn out of capital assets.

For a variety of reasons, which are not germane to this discussion, the capital which produced the railway systems fared badly during the decade of the 30's. Few companies could continuously obtain new funds on satisfactory terms, except through the sale of equipment trust certificates, to finance purchases of cars and locomotives on the instalment plan. The re-sale value of the property acquired, rather than the credit of the purchaser, is the essential factor in this arrangement. Unfortunately, no financial device is available to raise funds for fixed improvements with equal facility. These must be paid for out of surplus earnings or money raised on the credit of the enterprise.

Measuring the results of the period beginning January 1, 1930, more capital went out of the railroad industry than came into it; i.e., "on balance" the railroads disbursed more cash, derived through undistributed earnings, to pay off former investors than they obtained as new capital from other ones. The industry, considered as a whole, has been limited in its development to the cash which it produced as depreciation charges to operating expenses. It is a great tribute to railroad management that with these relatively small sums the carriers accomplished such important developments of their plant and equipment since 1929. This should place in better perspective the vitalizing effect which wholly adequate future capital expenditures will have.

Last year's net railway operating income was $1,500,000,000. Unfortunately, this must be regarded as a wartime "windfall." One dare not predicate postwar railway development on a continuation of such earnings. However, if one billion dollars of sustained annual net railway operating income can be retained, through all postwar years, it, together with the "other income" derived from non-operating sources, will service a capitalization reasonably commensurate with the invest-

ment which produced the American railway system. The resultant income available for leased line rentals and fixed and contingent bond interest will provide a sufficient margin of safety for the payment of these charges to permit securities on which they were paid to sell around par. A balance of more than $600,000,000 will remain after such disbursements to allow moderate dividend payments and provide over $300,000,000 annually needed for reinvestment in the property out of surplus earnings. This will represent one-third of the yearly total needed over a decade to produce "Super railroads."

A like amount will be derived from depreciation charges which are now mandatory on specified portions of the fixed plant and structures, as well as on cars and locomotives. These funds provide cash for capital purposes in amounts offsetting the estimated service life lost through action of the elements and wear and tear of traffic on the units of property for which this deduction of cash is made through operating expense. Serial equipment trust certificates are usually amortized by using funds produced through these equipment depreciation charges and thereby gradually extinguish the debt incurred to buy some of the cars and locomotives against which these are currently accrued.

To the extent that equipment depreciation funds are used to amortize equipment trust certificates rather than make direct payments on capital improvements, usually equipment, the benefit of current depreciation accruals have, in effect, been anticipated by having obtained the equipment provided thereby in advance of the date when the money to pay for it was obtained. Equipment depreciation funds are generally utilized in larger amounts to liquidate debts against equipment acquired previously than to make fully paid purchases of new units. This practice may be expected to continue in the future, and equipment depreciation funds will be used more to liquidate prior purchases rather than pay for future ones. Fortunately the problem of financing acquisition of adequate numbers of new cars and engines through sale of equipment trust certificates presents no serious difficulties.

The development of the railway plant represents the larger capital requirement and also presents the principal financial questions. Over the next ten years, in excess of three billion dollars of new capital, in addition to the requirements for refunding maturing obligations, must be invested, in approximately equal proportions each year to supplement the funds provided by surplus earnings, and either depreciation charges or sales of equipment trust securities to be serviced by these allowances of future years. While for the first few years, most of this last third of the total requirements will have to be raised through the sale of bonds, the financial benefits of the improvements being made thereby will so strengthen earning power and improve credit that financing by sale of stock should thereafter be feasible on a large scale. Acquisition of funds on this basis will be the final test and evidence of the success of "Super-railroads."

Existing junior issues of bonds must sell around par before new ones will be bought by investors, but stable earning power of one billion dollars per year will soon restore the credit of the American rail-

ways and reestablish the value of their bonds. In due course, continuance of satisfactory earnings; i.e., one billion dollars per year in postwar periods, with resultant freedom from the hazards of reorganization and a gradual increase in the number of companies restoring and maintaining dividends will open up capital markets to the sale of new issues of railway bonds and stocks, and provide the final third of the annual billion dollar capital requirement. During the first postwar year or two, lingering public skepticism over the railway credit may prevent the necessary total additional new capital being acquired through security sales. During that period, such deficiencies in available new capital must be made up out of the cash surpluses now being built up in railway treasuries. It is very important that taxes shall not impose too heavy a handicap on the creation of these accumulations, and such future drafts for capital purposes on cash resources place a limit on the extent to which present surplus earning power should be monopolized by debt reduction programs, notwithstanding the attractiveness of purchasing bonds at large discounts.

No amount of capital expenditure will enable a railroad train to operate at airplane velocities, but the operating speeds of "Super-railroads" will represent entirely satisfactory schedules for journeys of all lengths, especially when combined with the comfort that will be offered by postwar equipment and the convenience of through cars and through trains being extended between additional combinations of distant major cities. The unit costs of "Super-railroads" will permit such competitively attractive fares, for Pullman as well as coach passengers, that these price advantages combined with service adequately reflecting public wishes and needs will give the railroads increasing, rather than declining, passenger traffic over future decades.

"Super-railroads" will also permit these carriers to provide freight schedules representing 35 m.p.h. service on a basis of elapsed time from initial to final terminal, and yard switching requirements will add a minimum number of hours to the road haul time. Train loads will approximate water cargoes in tonnage and direct movement costs will be of similar amounts. Highway freight transport will lose, rather than gain, in proportional commercial transportation importance when "Super-railroads" recover the advantage of both price and speed and are, of course, fully supplemented by coordinated motor terminal and local services to the extent necessary.

In both freight and passenger service, winning combinations of speed and price can be found that will insure "Super-railroads" permanent and profitable retention of two-thirds or more of the internal commercial transportation of the United States.

The cost appears large, but represents only 50% of the present investment and it will be distributed over an adequate period of years to hold the annual capital requirements within limits that can be provided entirely from the industry's own revenues and private sources of new capital. Everything is relative; and the sum of ten billion dollars required to provide "Super-railroads" is but a fraction of the sum

that would be necessary to provide "Super-highways," waterways, and airlines of much less capacity and aggregate public utility.

The railroads can no more afford to refuse to pay the aggregate ten billion dollar cost of converting their plants into "Super-railroads" than this nation can afford not to pay the price of winning this war—for there is no alternative to Victory.

"Super-railroads" can win the contest of future competitive transportation at minimum aggregate cost and contribute the maximum benefit to the nation, while in no wise interfering with waterways, highways, airways, and pipe lines providing their specialized services, which will, as a whole, continue to perform but a minority proportion of the total national transportation requirements.

Robert Wright

By William Spawn

In the museum of this Society in the Baker Library, I have deposited a tiny model of a locomotive, made for and presented to Robert Wright, my distinguished grand parent, for his services in Russia. This little model could be worn as a watch charm but it is a gray iron casting.

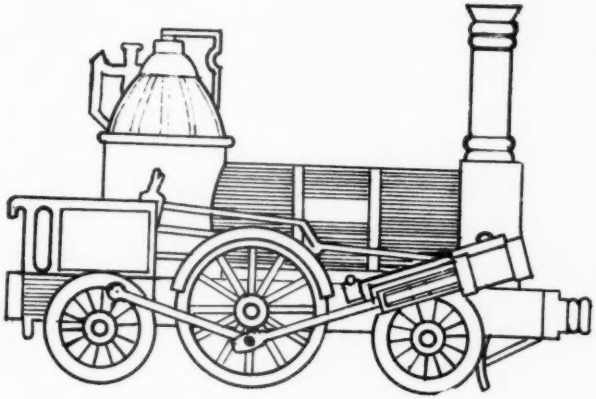
Robert Wright was born February 19, 1817 at Keighley, Yorkshire, England, son of Jonathan and Mary Wright. In 1820 his parents emigrated to Philadelphia and after a brief schooling he was apprenticed to the firm of Hyde & Flint, on Beach Street. Here he learned the rudiments of mechanics and it was not long afterwards that he entered the employ of Garrett & Eastwick, who were located at that time in Wagner's Alley, near Seventh and Race Streets.

The training that he received here, together with his natural ability soon won for him the confidence of his employers. The railway was in the process of evolution and his employers were in the front rank of builders of railway equipment. When Messrs. Harrison, Winans & Eastwick obtained the contract to build the equipment for the Russian Government for the railway between St. Petersburg and Moscow (see our Bulletin #47), Robert Wright was selected as the mechanic best suited to assume charge of the enterprise. It was no easy task to move the machinery from the Philadelphia plant to Russia, but it was finally completed and the work was commenced of building locomotives and cars in the Alexandrovsky Arsenal.

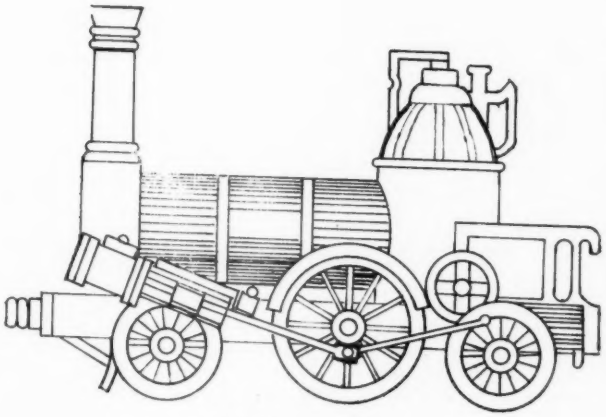
For six years he played a prominent part in directing the construction of this equipment. He, like the other Americans that accompanied him from the Eastwick & Harrison works, were in a strange country with different customs and language and, added to that, a severe climate. He returned to Philadelphia in 1850 but the following year he returned to St. Petersburg and this time he was placed in charge of the works.

The first contract between the partners and the Russian Government was for the construction of 162 locomotives and 2500 iron trucks for freight cars before the end of 1851. Upon completion of the first contract, a second was entered into that called for the repair and maintenance of this rolling stock and this contract expired in 1862. This work was carried out under the direction of Robert Wright. During the Crimean War the marine engines for the Russian gun-boat fleet were constructed under his direction. For this he was decorated with a silver medal on a ribbon of the order of St. Stanislaus.

He returned to Philadelphia in 1856 and having acquired a comfortable competency as the result of his efforts, he retired from active mechanical work. In 1840 he married Emily Shoch, daughter of George P. and Maria Shoch. Their daughter died in Russia and their son was



Right Side of the Model.



Left Side of the Model.

killed at Murfreesboro, Tenn., during the Civil War. Always taking a lively interest in present day affairs, a defect in his hearing which ultimately made him totally deaf, prevented his engaging in any active work.

He was a great believer in canals, in that they could compete with the railroads in the carrying of heavy and bulky products. He considered it unwise to permit the railroads to purchase or lease these canals and then allow them to decay through diversion of traffic. He was deeply religious, pronounced in his convictions but ever tolerant of the opinons of others. For forty years he lived quietly in Philadelphia, his life saddened by the loss of his children but brightened by deeds for his fellow men. He died January 11, 1897.

Robert Wright was the elder of three brothers—Samuel and William. It was in the work shop of Hyde & Flint, of Kensington, that James Brooks constructed his locomotives, aided by Robert and Samuel Wright. From what I can learn the running gear of this locomotive was after the six wheel engine built by Baldwin with one pair of drivers behind the firebox and with outside cylinders. The cross head slides were made in the form of a cylinder, bored out and arranged to serve the purpose of feed pumps, the cross head forming the piston of the pump. The connecting rod entered the lower or open end of the slide, which was large enough to allow clearance of the angles of the main rod. The usual valve chamber was placed at the upper end of the slide from whence a pipe led to the boiler. This mode of arranging a feed-pump was more ingenious in design than useful in practice and was not repeated on the second engine built by the same maker.

The reversing mechanism was similar to the Costell plan. The slide valve was open through the top—from the exhaust cavity underneath and terminated in the cylindric form(?) in which was fitted a metallic spring piston closing up the opening through the valve. When the engine was going forward, steam from the boiler entered the steam chest and the slide valve acted in the usual manner. When going backwards, by the peculiar arrangement of a slide valve which acted also as a steam or throttle valve, the steam from the boiler, by a process similar to a two-way cock was turned under the cylinder slide valve and into the cavity of the exhaust, forcing the piston in the top and the valve upward and against the evenly planed under surface of the steam chest lid, the exhaust pipe becoming the steam chest and the steam chest the exhaust pipe and vice versa, when the movement of the engine had to be changed.

This mode of throttle valve and reversing valve in one, combined with the piston slide valve, was a most simple arrangement. It had, like Costell's, the same defect in the matter of the lead of the slide valve. Eastwick & Harrison built two locomotives in 1838 with vibrating valves moving on faces on the side of fixed cylinders. In both, the throttle valve and reverse were combined in the same manner as in the Brooks and the Costell engine, by the movement of the slide valve moving over three openings.

On the second engine built by James Brooks, an attempt was made to secure the adhesion of the forward truck wheels in combination with one pair of driving wheels behind the firebox which worked with fair success. These were the only two engines built by James Brooks, aided by Robert and Samuel Wright and it is safe to assume that they played a part in their construction and added much to their knowledge.

One of the papers that has been preserved is one containing the instructions issued by Thomas Winans at Alexandroffsky, Jan. 24, 1857, to William Wright for the boring and mounting of car wheels. The following are his instructions:

1. The holes in all wheels should be bored *true* with the tread and flange, and that they should be bored of the *exact proper size* and as *smoothly as it is possible to bore them* by taking great pains constantly in having *the lathe in first rate order* and an ample supply of tools and instruments to be constantly in *first rate order*.

2. The turning of the axles should be done with great care and such as are to have wheels fit on by you, the first on which the wheel is fit, should be *turned very smoothly*, so that the wheels should not go over so hard as to bind the axle when it may still fit tightly enough to make a first rate job.

3. The wheels should be placed on to the axle with very great care, the wheel to fit the axle *tightly and properly in every single case*. Do not in any case or under any circumstances allow a wheel to stay upon an axle and be turned out of your shop which does not fit the axle tight and be particuar to have them always, the wheels, the proper distance apart according to gauge.

4. The keys put in the axles and wheels should in all cases be of exactly the same width, and should have their edges perfectly even, when the wheel is pulled on, and the keys should be *particularly well fitted* in each case and drove tightly and secured in their places by flatting down the end which projects through the wheel.

5. The axle to be tried in all cases after the wheels are placed on it to see if it has not been bent in any part and if the wheels run true upon it, and in all cases remedying the defect if you find a bent axle or untrue wheels.

It is absolutely necessary for our interests that the above named work especially, and the work in general, done in your shop should be attended to in the very best manner and we are *determined that it shall be*. We consequently request that you will take hold of this business in a different manner from what the work is being done at present and get it to going in the proper workmanlike manner in every respect, with the least possible delay.

Another notice that has been preserved is as follows:

GENERAL REGULATIONS
to be observed
By all persons employed
by the
Contractors for the Remount, etc.
of
Movable Machinery
on the
St. Petersburgh and Moscow Railway.

---

1. Employes of the Contractors, disapproving of these or any other Regulations that may hereafter be issued, or not disposed to aid in carrying them out, are requested not to remain in the employ of the contractors.

2. Each person in the employ of the Contractors, is to devote himself exclusively to the Business that may be assigned to him, and will be expected to execute it with carefulness, and in due time; any frequent omission in this respect, will not be overlooked.

3. Every employe of the Contractors will be held strictly responsible for any neglect in the fulfilment of his duties, or in the duties of those who may be under his charge.

4. NO ONE, whatever may be his position, can be allowed to absent himself from his duties, without first obtaining permission from the Contractors, or from some one authorized to grant such permission.

5. All persons in places of trust, must report any misconduct or negligence, which may come under their notice, affecting the general interests of the Contractors. WITHHOLDING such information, to the detriment of the business of the Contractors, will be considered as a proof of neglect or indifference, on their part.

6. Every person in the employ of the Contractors, must with promptness and fidelity, obey all instructions he may receive from the Contractors, or from others placed in authority over him. He will be liable to immediate dismissal for disobedience of orders, negligence or incompetency.

7. Want of strict attention to business growing out of INTEMPERATE HABITS cannot in any case be overlooked. And should any one in the employ of the Contractors, be known habitually to indulge in inebriety when away from his post, such conduct will be considered as risking a neglect of duty, although neglect may not have taken place.

8. All persons leaving the employ of the Contractors, must deliver up any property entrusted to their care. And if required, must give such information as they may possess, in regard to the business they had had in charge.

9. Any employe who may be DISSATISFIED with the salary he is receiving, or from any other cause, is requested to make his case known in writing to the Contractors without delay.

April 30th, 1852. WINANS, HARRISON & WINANS.

Among the many mementos that Robert Wright brought back to this country on his final return was the little model already referred to, given to him by the Russian workmen in the shops under his supervision. It is supposed to represent the first locomotive in Russia, but aside from possible mechanical defects in its portrayal, it is a shining example of the skill of the patternmaker and moulder. Some Russian, with a keen sense of touch and his sharp tools, must have fashioned this pattern. Another Russian must have had knowledge to obtain an unusually fine sand and been an expert moulder to have made this tiny casting. It seems to me that in presenting this fitting tribute to so skilled a mechanic as Robert Wright, the men showed *their* skill in fashioning the gift. It is where it will always be preserved and will remind us of the part that America played in building the St. Petersburg to Moscow railway.

Pennsylvania Railroad Class O Engines

(WITH SOME REFERENCES TO THE CLASS P)

By C. B. Chaney

In Bulletin 59 there was described the long line of the Class P engines of the P. R. R.—engines at first designed for anthracite as fuel, and in later years using either hard or soft coal. However, contemporaneous with the "P" engines, the Class "O" were designed, which, with their deep fireboxes set between the driving axles, could only use soft coal as fuel.

In discussing the original "O" engines, we must necessarily include the Class "N"—the two classes being in every respect identical except as to cylinders, which were 17″ bore on the "N," 18″ bore on the "O." Inclusion of the "N" is occasioned by the fact that on adoption of the new 1897 classification, the "N" engine was assigned the new class of D8, while the "O" was assigned class D8a, which in reality meant a sub class of D8—instead of assigning it to a new class D9, because of its larger size cylinders. Why this oddity occurred is not known at this late date.

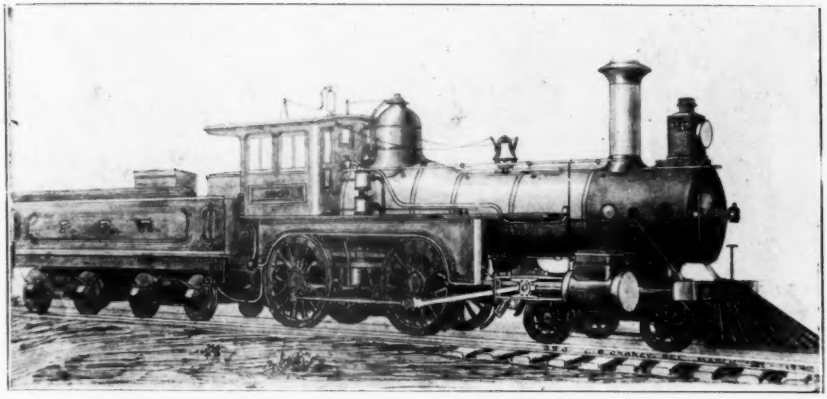
In this description there is shown the initial engine of each of the three main classes of engines—these illustrations being drawings made to the same angle of perspective and scale so that the differences in detail, and growth in size, can be readily observed.

Classes D8 and D8a

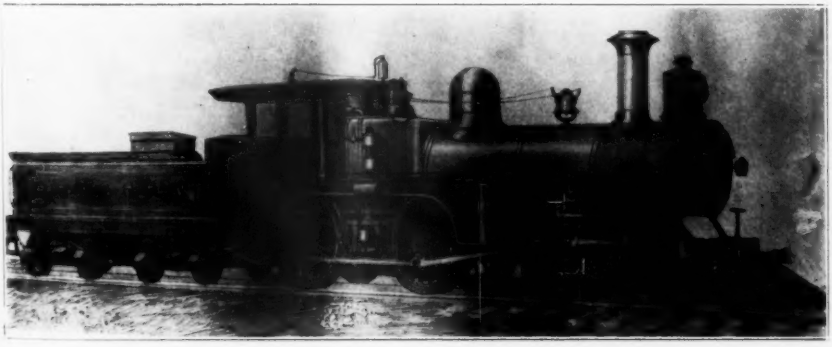
The first "N" (new class D8) engine was P. R. R. No. 995, Altoona shop No. 800, which was turned out in June, 1883. A total of ten D8 engines were built before the first "O" (D8a) engine was built. This engine was P. R. R. No. 1047, Altoona shop No. 810, completed July, 1883. A month later the first "P" (D11a) engine was completed at Altoona, and it will thus be seen that the original N, O and P engines were all of the same vintage of 1883.

The D8 and D8a engines had 54″ wagon top boilers, high domes, sand boxes in wheel covers, alligator cross heads, and two bar guides, cap stacks without beading, etc. As first built the whistle was located on cab roof, the 65″ pilot had a coupling bar, and an Ashton blow-back safety valve, exhausted into the tank. Later the whistle was tapped into the side of dome, the old well known wrought iron bull noze replaced the coupling bar, and the Ashton valve was changed to the old P. R. R. design having a muffler located on cab roof.

The cylinders of the D8 were 17x24″, and of the D8a 18x24″. Principal dimensions were: drivers 62″ diam., driving wheel base 8′ 6″, and total wheel base 23′ 5½″, firebox 35x72⅝″; heating surface 1392 sq. ft., working pressure 130 lbs. The center line of boiler was 6′ 8″ above the rail, the weight on drivers was 58300 lbs, while the total weight was 91900 lbs.



The First D8a. P. R. R. 1047. Altoona, July 1883.



The First D9a. P. F. W. & C. R. W. #114. Altoona, Oct. 1889.

The First D10a. P. F. W. & C. R. W. #153. Altoona, May 1890.

"Pennsylvania Limited," D10A Eng. 568, on Rockville Bridge.

From 1883 to 1888, thirty-five D8 engines were built at Altoona and six at Renovo; and sixty-six D8a engines were built at Altoona, twelve at Renovo, and seven at Dennison shops.

Classes D9 and D9a

In 1889 the "O" engine was redesigned to use a Belpaire boiler, and to use both 62 and 68″ driving wheels (classes D9 and D9a respectively). In these engines the Belpaire firebox top was about six inches higher than the barrel of the boiler. The steam dome, without opening, was placed in the middle of the boiler, while an auxiliary dome, containing the pop safety valves and the whistle was placed on top of the Belpaire. Sand boxes in the wheel covers, guides, cross heads, rods &c. remained the same as before.

The first D9a engine was Altoona No. 1430, built Oct. 1889, and was engine 114 of the P. F. W. and C. R. W.

The cylinders were 18x24″, boiler diam. 54″, and set 7′ 1″ (on D9a) above the rail. Firebox 35⅛x72⅜″; heating surface 1283.6 sq. ft.; working pressure 160 lbs; weight on drivers 61450 lbs; and total weight 98300 lbs. The wheel base remained as on the earlier class.

Altoona built two D9, and thirteen D9a engines, and two D9 engines were built at Dennison shops—all built in 1889, and all for the Lines West—No D9 or D9a engines being used East of Pittsburgh.

Classes D10 and D10a

In 1890 there was a further redesigning, in which the Belpaire boiler was enlarged to 57″ diameter, with a flush joint between the barrel of boiler and the Belpaire top, replacing the 6″ step at that point on the previous design.

The first engine with 57″ Belpaire boiler was Class D10 (62″ drivers) No. 131 N. C. R., Altoona No. 1496, completed May, 1890, while the first D10a (68″ drivers) engine was Altoona No. 1501, built May 1890, as P. F. W. & C. R. W. No. 153.

The D10a engine had its boiler set 7′ 4¾″ above the rail. The firebox was 32½x72⅜″, heating surface 1256 sq. ft.; working pressure 160 lbs; weight on drivers 65400 lbs, and total weight 103600 lbs; cylinders and wheel base same as before.

At this period, the prevailing height to top of stack on the P. R. R. passenger engines was 15′ 0″; yet on the earlier D10a engines, this height was made 14′ 6″, resulting in a shorter stack which added to the pleasing and impressive appearance of the engine, and, in fact, these engines were among the handsomest ever turned out at Altoona. Easy curves of large radius were found in the details. The cab windows, instead of having sharp corners, had these corners rounded with a generous radius at top and bottom; the cab had a wide overhanging roof, the eaves of which were deep and flat, with well-rounded corners front and back.

Besides the twelve D10 and D10a engines owned by the N. C. R. the writer vividly recalls the D10a engine No. 2114 P. R. R. (belonging

to the Phila. and Erie), which for many months handled through trains of the N. C. R. between Baltimore and Harrisburg; always kept clean and fresh looking, No. 2114 was one of the most beautiful engines he has ever seen.

As showing the handsome appearance of a D10a engine with train, there is illustrated herewith a photograph taken in 1891, or 1892, of the "Pennsylvania Limited" train, engine 568, on Rockville bridge near Harrisburg.

From 1890 to 1892, there were fifty-two Class D10 and fifty-seven D10a engines built at Altoona. These were assigned to the P. R. R., Philadelphia and Middle divisions, the P. and E., N. C. R., and the Lines West.

In later years some of the D9's and D10's, on the Lines West, were modified. The auxiliary dome with safety valves and whistle was removed from the Belpaire top. The steam dome was opened up and the pop valves were located on the top, while the whistle was tapped either into the rear side of dome, or into the bridge pipe which led back to the cab.

While these modifications doubtless had their advantages, they detracted from the neat, symmetrical and pleasing appearance of the engine as originally built—the long, naked top of the boiler between the dome and the cab being particularly conspicuous.

Location of the sandboxes in the wheel covers was abandoned in the late 1890's and all the classes D8 to D10a had their sandboxes removed to the top of the boiler.

While the old "O" classes were not built as long, nor developed to the same extent, as were the old "P" classes, they were found on the Philadelphia and Middle divisions, on the P. & E., the N. C. R., and the Lines West, where they hauled the best trains for many years; and they were always rated highly by the men.

The Dismal Swamp Railroad Company

By H. T. Crittenden

To most of us "The Great Dismal Swamp of Tidewater Virginia and North Carolina" is a place of gloom and mystery where the sun never reaches the ground, a place where the deadly cotton-mouthed moccasin and his brother the rattler vie with Old Man Malaria and his two cousins, Lingering and Slow Death, in keeping Man out of one of Nature's last strongholds. Wild cattle as vicious as the bears and cats roam the tall grass and splash through the steaming slime in their constant wanderings. Blood-thirsty flies and mosquitoes swarm in droves and attack anything that promises a meal. It is only after the cold of mid-winter has driven the pests to shelter that Man can enter the swamp with any degree of comfort or safety and then he runs the risk of becoming lost. Many a man has wandered around in circles until he dropped from exhaustion for it is easy to lose one's self in those fifteen hundred square miles of wilderness. Fifteen hundred square miles of tomorrow's coal and today's timber.

Into this wilderness steel fingers were shoved, twin streaks of rust in the form of logging railroad, both standard and narrow gauge. Richmond, Rope, Arbuckle, and innumerable small companies leased timber land and reached in from high ground. Practically all of them have long ago decided the cost of reaching in was more than the timber was worth and so pulled up their track.

Possibly one of the earliest companies to try logging on a large scale was the Dismal Swamp Railroad Company, or as it is known today, the Dismal Swamp Corporation. There are many examples of logging companies finally becoming railroad companies but the cases where a railroad company turned logging company are few and far between. The swamp was to blame for that. To built a saw mill was a simple thing but to build a railroad through the swamp was something else and a very costly undertaking.

During the early '90's a logging company located their mill on the south bank of the Chesapeake & Albemarle Canal a mile and a half west of Great Bridge, Va., and began logging land to the south leased from the government. To bring their timber out of the swamp a railroad was built, a 42″ gauge affair that was extended in a wide arc in a southwesterly direction. Its length increased as the land was cut over. The rolling stock consisted of one engine and several logging cars.

By 1896 the end of steel had reached a point 2.5 miles from the mill but it was beginning to be painfully evident that every cent of profit received from the sale of timber was going into the construction of the railroad. A railroad was a necessity if the company was to continue operations but some means had to be found to get around the high cost of construction. The really dense part of the swamp is only thirty miles long by ten wide but even that can eat up a lot of money. A dummy railroad seemed to be the answer.

A charter was granted to the Dismal Swamp Railroad Company to build a railroad from some point on the Chesapeake & Albemarle Canal near Great Bridge, Va., to a point on the Albemarle Sound in North Carolina and to operate such a road as a common carrier. Tucked away in the legal phrases there was a clause which gave the company permission to log such land as they might acquire along the right-of-way. No opposition appeared to contest the issuance of the charter simply because no one was interested in a road that anyone with two grains of common sense knew would never be built.

The new railroad company promptly "acquired" the property of the lumber company and made plans to extend the railroad into new timberland. Although there are no records of the amount of equipment the D. S. "acquired" nor the slightest hint as to the builder of the "motive power," we can safely say she came to the road "third hand." Just to keep our records straight we will call the engine the original #1.

Many times the question has been asked why all the narrow gauge roads operating in the swamp were built to a 42″ gauge. The easiest answer and the one most given is that 42″ is the narrowest gauge considered safe for operation over the spongy ground. However, when most of these roads were being built the Virginia & Carolina Coast R. R. operated a 42″ gauge road from Suffolk, Va., to Edenton, N. C., which paralleled the western boundary of the denser part of the swamp. The logging lines on that side preferred the 42″ gauge so that their equipment could be handled by the V. & C. C. It has been said that the V. & C. C. shops at Suffolk serviced more "foreign" engines than they did their own. The interchangeability of equipment probably had more to do with the selection of 42″ as the "swamp gauge" than the sponginess of the ground did.

Work was pushed right along on the road. From the end of the original line the track ran in a southerly direction a distance of 4.5 miles across an arm of the swamp before it again hit high ground. For this entire distance it was necessary to lay the 25-lb. iron on an embankment to keep it above water during the rainy season. This fill was formed by digging an immense ditch on either side of the right-of-way and throwing the dirt in between. After it had settled about a week the top of the pile was smoothed off and the track laid. The embankment was cut at frequent intervals to allow the water to pass without banking up against one side or the other, depending upon the way the wind was blowing. These cuts were bridged by little wooden culverts.

Seven miles from the terminus, on the canal, a permanent logging camp was built and there the railroad shops were located. This logging camp became known as Benefit while the settlement around the lumber mill became known as Camden Mills. Both settlements were typical "company towns" where the corporation owned everything from the church to the saloon.

A short distance south of Benefit the road swung west until it crossed the Dismal Swamp Canal and then swung south again. Before construction ceased there were approximately 35 miles of main line and at least one branch which ran east several miles from a point a

mile and a half north of Benefit. This branch was built strictly for logging purposes and was pulled up during the late '20's. Practically all of the line south of Benefit had to be built on a fill. At the end of the main line another logging camp was built and was eventually designated as Lynchs' being approximately a half mile south of Lynchs' Crossroads, N. C. A small mill was also located here. After the timber in the immediate vicinity of the mill was cut an extension of the main line was laid running east and south a total distance of 9 miles and extending down into Perquimans County. This line simply died in the swamp.

Engine #2 was actually the road's first engine, being purchased by the Dismal Swamp Railroad Company for service on their line. She came to the road soon after construction was started and was a Baldwin-built 0-4-2 saddle-tank known as "SUE." Engine #3 arrived in October 1902 and was a Baldwin Mogul with a rather long wheelbase. All the road's motive power were woodburners. Apparently #1 was pretty well worn out and was scrapped as soon as #3 arrived for the company's report to the State Corporation Commission in 1908 listed only two engines. The report also stated there were thirty-two logging cars and thirty miles of main line, fifteen of which were in Virginia. The gross income for the year was $10,342.73 against which were charged repairs of $1,981.03 and an operating expense of $8,008.20, leaving a net income of $353.50. Gustavus Milhiser was president with J. Scott Parrish, treasurer, and T. K. Parrish, secretary. The mileage given in Virginia was an approximate air line distance furnished for taxation purposes. The distance from Camden Mills to the state line was actually 20 miles.

Gradually the company added to their motive power until engines 4, 6, 8, 9, 10, 11, and 12 appeared on the roster. They came and went. No engine stayed very long on the road except #3 and #6. Very little information is available on any of the engines for no one took much interest in them except from an operation standpoint. Engine #4 was a 14-ton American 4-4-0 purchased second hand and rebuilt by the Atlantic Iron Works in Norfolk before being put in service. Engine #8 was a Porter Mogul purchased new in 1911. Numbers 6 and 9 were duplicates purchased from Vulcan Iron Works in 1909 and 1912. The Porter #11 was from the same patterns as #8. In purchasing #12 the company deviated from their policy of using only rod engines and brought in a Shay. For some reason she was not considered satisfactory and the Richmond Cedar Works, which had taken over the road by that time, promptly made her standard gauge for use around the yard. There was a #5, a gasoline driven 0-4-0 built at the Berkley Foundry & Machine Works, Berkley (Norfolk), Va., and known as "GUINEA." There was no engine numbered "7" so far as anyone remembers.

Financial conditions gradually became worse until they came to a head early in 1911. The practice of charging transportation for the haulage from the woods to the mill at so much per foot-mile against the final profit kept the logging end of the business operating at a loss. This procedure was necessary as the I. C. C. had a strict ruling forbid-

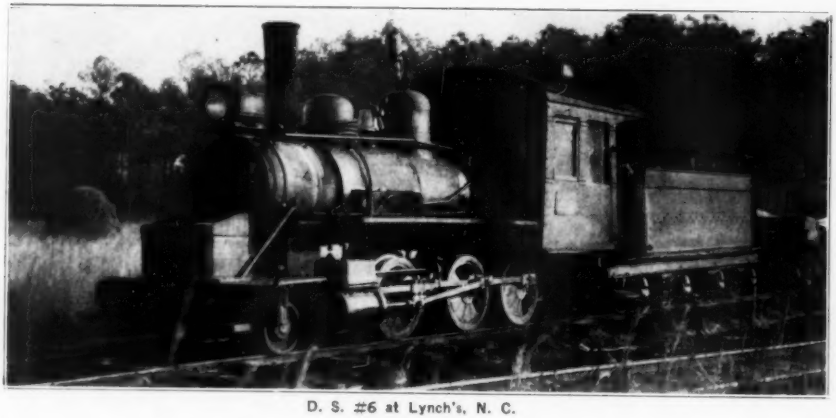
ding any common carrier to allow special rates to any customer. The railroad and logging businesses were separated, the logging end being known as the Richmond Cedar Works while the railroad continued to be known as the Dismal Swamp. Although the R. C. W. owned all the stock in the D. S. it was necessary for the lumber company to "rent" the railroad to get around that bothersome I. C. C. ruling. Its duties as a common carrier had to be continued although the officials didn't go out looking for business.

As soon as the reorganization was completed the lumber company constructed a standard gauge railroad to connect Camden Mills with the Elizabeth River Railroad, better known as the Norfolk & Portsmouth Belt Line R. R., and to tap a new stand of timber just to the south of Deep Creek, Va., on the west bank of the Dismal Swamp Canal. For motive power on their new line the rebuilt D. S. #12 was used along with a little 0-4-0 tank engine. In 1913 a convertible Prairie type was purchased from Baldwin along with all the necessary parts to narrow her down to 42" gauge if the occasion ever arose. This engine was numbered "10" and was one of the smallest standard gauge road engines ever to appear in this section. The top of her stack was below the running board of a standard box car.

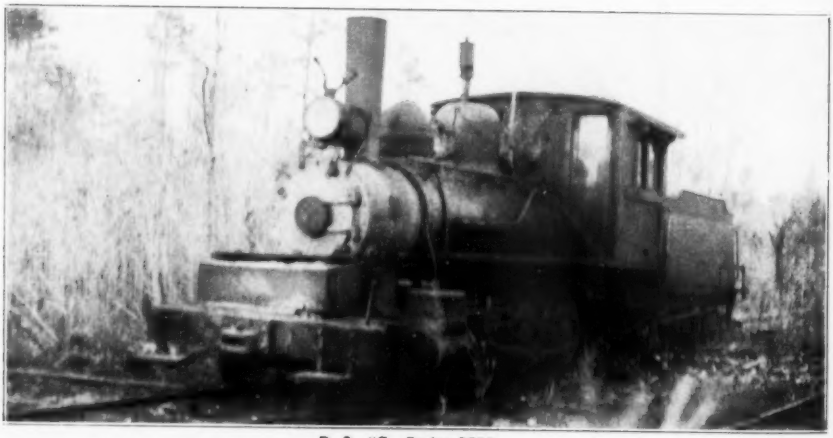
Up until the time the R. C. W. took over, the motive power used wood as fuel but the new firm had other plans for its waste material so began using coal. A few years later a particularly dry season hit the swamp and numerous fires broke out. The government accused the various railroads of starting them and several lawsuits resulted. As was to be expected the railroads paid for the damage and paid plenty. For some reason the D. S. escaped being dragged into court but the stiff damages awarded the government scared the management into converting all the narrow gauge engines into oil burners. Operating thus they had the distinction of being the only oil burning engines in the state. The equipment installed for burning oil was unique in its simplicity. The oil ran by gravity from the tender to the fire pan and was controlled by a valve at the fire door. Naturally the arrangement leaked freely and it was easy enough to tell when a train had passed by the fresh oil on the track.

Northbound logging trains were made up either at Angle Siding, where the main line crossed the Dismal Swamp Canal, or at Lynch's, the end of main line operations. The "swamp engine" gathered in all the loads and lined them up for the crew bringing in a string of empties. The road crew did no swamp work while the swamp crew did no road work unless the swamp engine was needed along the line. There were times during the rainy season when the swamp crew would railroad all day and never see a length of rail. They worked entirely by feel and intuition. As long as the engine would roll they figured she was on the track. If they missed a switch they hunted around in the water until they found it. If they reached into a siding where the water was a little too deep and the fire was drowned, they got out the best they could on stored steam. Operating under such conditions it was neces-

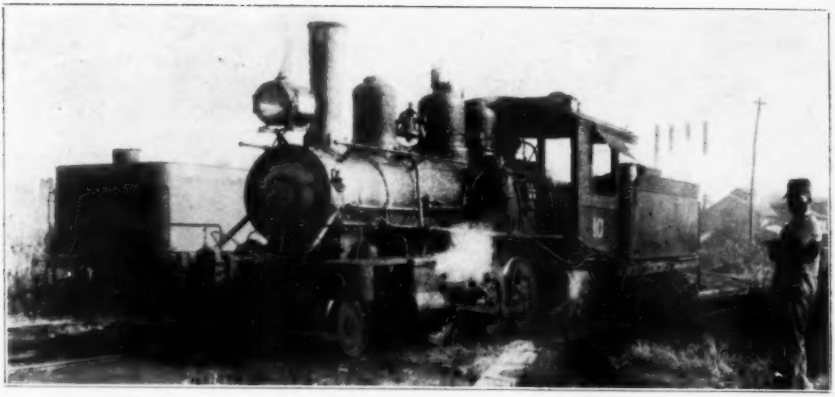
D. S. #3 at Camden Mills, Va.



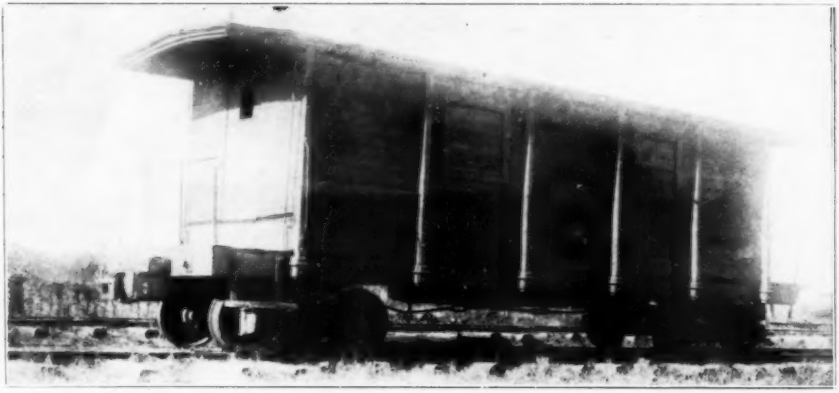
D. S. #6 at Lynch's, N. C.



D. S. #8—Porter 1911.



R. C. W. R. R. #10 at Camden Mills, Va.



Passenger Car at Benefit, Va.

Log Train at Lynch's, N. C. Main line to right.

sary to alter the method of sanding the rails. Several ways were tried but the most effective was to mount the sand box on the front bumper beam, station a man out there with a shovel, and let him use his own judgment. At least some of the sand was bound to land on the rail.

When operating "at sea" all sorts of trouble could be expected to happen. At one time a lazily floating log tangled up between the engine and the tender. Before the engine could be stopped the oil line valve on the bottom of the tank had been broken and the fuel began to escape. Attempts were made to stop its flow but as the fire was dead and the steam started dropping there was nothing to do but forget the oil and head for high ground. Washed out track was a rarity for there was not enough current to cause trouble. Soft track was something else. The D. S. was mostly certainly the only road which required that when the train hit a section of soft track that it be speeded up. The idea was to get the train over the weak spot before the track had a chance to slide out from under. To the modern railroader such an idea is pure bunk but, believe it or not, it really worked. On the other hand, derailments were frequent in spite of anything the crew could do and a round trip without one, two, or even three stops to put a truck back on the iron was something to talk about. If the wheels happened to drop between the ties while the train was hitting the high spots, the pile-up was generally something wonderful to behold.

To help take care of some of the major wrecks the company purchased a wrecking crane. It was a small affair but was considered all that was necessary. The story is that it never was used for on its first call it became hopelessly derailed. Anyway, it didn't last very long for the company stuck it on a siding at the "Mills" and there she stayed until a firm dealing in sand and gravel bought her for use as a dredge.

Engine #9 jumped the track one day while pulling a log train north. Her speed was such that before the engineer could stop her she went down the fill and started across the cyprus knees with her train urging her on. She finally rammed up against a granddaddy and stopped. The fallen trees and knees hadn't improved her running gear any and when the master mechanic arrived on his speeder and took a look at her, he decided the only thing worth taking home was the boiler. The 6-spot had been having boiler trouble so #9's boiler went on #6's running gear, the number plate was turned upside down and a rebuilt #6 took over the swamp work.

Trouble on the D. S. wasn't confined to the wet season for when the sun beat down day after day and dried the bear grass and turned the water into steaming pools of stinking slime, fire was an ever present danger. Fire wardens kept a constant watch and every whiff of smoke came in for instant attention. The company telephone line from Camden Mills to the end of steel was constantly patroled for breaks and a report of a fire caused more consternation than a war. Everybody turned out to fight a fire. If a blaze got beyond control and crept up on the logging camp, the swamp engine would couple up to everything in sight and head for the canal. The many little wooden trestles were a constant source of danger for if one happened to burn out ahead of a train

racing through smoke thick enough to cut with a knife, well, they came in from the canal after everything had cooled off and salvaged what was left. There was quite a large pile of twisted frames and rails at Benefit as a silent monument to crews of trains that didn't quite make it. The sudden clanging of the shop bell at Benefit during a dark night when there was a glow in the sky to the southwest caused more than one woman to offer a prayer for the safety of her menfolk in the swamp.

After a fire had burned over the surface the danger was far from over for the swamp is made up of peat and the fire will burn under ground for months. The only sign is smoke pouring from blow-holes. Men walking across apparently solid ground have been known to suddenly drop from sight into a burning inferno. A stick stuck into the ground will burn off to within a foot of the surface. Sometimes the fire will burst through the surface like a volcano and then the fight starts all over again. To guard against a train falling into one of these fire pits, the entire track through the burned over section is inspected by an engine shoving a car loaded as heavily as possible. This car was generally stuck on the front end of a string of several empties with the engine just as far in the rear as it was possible to get. The job barely crawled over the line so that the ground would have plenty of time to give way under the load.

Along with such unpleasantries as fire and high water the crews had to put up with the wild life. It was always wise to poke all the corners of your cab with a long stick before climbing in for rattlers had a rather curious habit of crawling into a cab to sleep near the warm boiler. On one occasion an engineer barged into his cab and came face to face with a swamp cat sitting on his seat. Both tried to get out of the same gangway at the same time. Never, never argue with a wild cat over the right-of-way. In passing under overhanging branches the exhaust of the engine had a way of startling sleeping snakes causing them to drop on the train. If one happened to land on the gangway it was easy enough to brush him off into the bushes if he didn't have a chance to coil. Once in a while wild cattle would dispute the right-of-way with a train but a blast of the whistle generally settled the argument. None of the swamp animals like noise.

It is to be kept in mind this road was a common carrier "officially" hauling freight and passengers. A passenger train consisting of an engine, a flat car, and a passenger car left Camden Mills five days a week at 4:30 a. m. and returned around 8 p. m. A regular freight made a round trip while the passenger train was at the southern end of the line. There were only four regular stops, Camden Mills, Benefit, Angle Siding, and Lynch's, sometimes referred to as Lynch's Crossroads. At this point was located a second permanent camp. The passenger train ran only as far as Lynch's although the track extended on another 9 miles south. The distance from Camden Mills was considered 35 miles. A passenger could board or leave a train at any point along the line simply by informing the engineer of his intention. There was no agent at any of the stations as no tickets were sold, in fact, there was no fare collected. The freight and express either went by the pas-

senger train or with the mail on the rail motor. The paymaster and superintendent used a converted Model "T" Sedan. The road gang had standard narrow gauge speeders.

During the business boom of 1916-17 the company purchased an engine to replace old #1. To be more exact the engine came to the road with the number "1" on her smoke box and the company didn't bother to change it. She was a Baldwin 2-8-0 built in 1912 and came from the Greenleaf-Hollister Lumber Company of Hollister, N. C. She was much too heavy for the road. Engine #8 had been "sold" to the Richmond Cedar Works who sent her south to Gum Neck, N. C. It was around 1920 the shops were moved to Camden Mills and combined with those of the R. C. W. R. R. A single stall engine house remained at Benefit until around 1936.

The equipment of the D. S. consisted mainly of steel logging cars. Besides these there were at least two tank cars, a rather large box car, several sizes of flats, a half dozen double-truck dump cars for constructing branch lines, and a passenger car. This passenger car was a home-made affair mounted on a couple of logging trucks but there wasn't any doubt as to what it was. During the evening of the road's life the passenger train tied up at Benefit. The motive power was gradually sold and scrapped down to three engines, #1, #3, and #6. About 1939 the passenger service was discontinued and the car scrapped. The lone box car became a tool shed and then fire wood. The road depended entirely on logging for its existence and, frankly, the lumber business wasn't so good.

The R. C. W. began talking of replacing the railroad with trucks and to use the right-of-way as a private road. After giving the idea serious attention it was ruled out as trucks cost too much. The company had been put under receivership sometime before but the receivers flatly stated that the replacement of the railroad by trucks was no way to make money. During the summer of 1941 the creditors closed down and caused the lumber company to be sold at auction. The Dismal Swamp Corporation took over and combined both the railroad company and the lumber company. The state promptly granted permission to discontinue service and plans were made to scrap the railroad. All the equipment was relettered "D. S. CORP." however, and trains were run until trucks could be purchased. Early fall saw the company ready to do business by highway so the scrapping started at Lynch's and continued north to Camden Mills. The final steel was pulled up on November 27th, 1941 at Camden Mills. The section of track south from Lynch's was left in operation until the standing timber could be cut. Engine #6 with a few logging cars was left on the "orphan" section. It was necessary to haul all logs from the railroad to Camden Mills by truck for the line connected with no other railroad, had no river outlet, nor touched any village or town. So far as the Dismal Swamp Railroad was concerned it was officially dead on the date of sale of the Richmond Cedar Works.

The standard gauge railroad fared no better than the narrow gauge. It ceased to be the Richmond Cedar Works R. R. and became part of

the Dismal Swamp Corporation. In September 1941 the state boiler inspector ordered the working pressure of their #10 cut to 120 lbs. Working at this pressure she couldn't handle over two loaded cars so it was necessary to put a little 0-4-0 saddle tank numbered 12 back in service. In November #6 of the Roper Lumber Company was purchased and completely rebuilt. Number 10 was stored. The tender behind #10 is a reorder job built by Baldwin for the Surry, Sussex & Southampton Rwy., a former 36″ gauge road, and was used behind #12 of that narrow gauge. At the same time a spare tank was purchased which had been used behind #10 of that road. And thus ended the history of this interesting logging road.

A Few Railroad Statistics or Who's The Biggest?

By R. L. Martin

The experts say that there is no such thing as an up-to-the-minute compilation of railroad statistics. Before the ink is dry, any written account on the subject becomes obsolete and about as permanent as the proverbial snowball.

Today's recordings become twisted, out of joint, tomorrow in the day-by-day railroad progress and dissolution, new construction and abandonments, new controls and severance of old agreements.

With this in mind, the skeleton lists shown here are compiled merely to provide a quick, ready reference for comparison of our leading railroads as they appeared in the 1942-1943 period. Any close student of any particular road may offer greater detail and accuracy. However, the present objective is to furnish a general overall picture of the approximate extent and operations of a few of our top-notchers in rail transportation. Of importance to remember, is the fact that the mileages shown here are operated miles which may or may not be wholly owned.

The 1302 railroad companies in the United States are grouped into seven classifications:

Class 1—with revenue exceeding $1,000,000	132
Lessors to Class 1	274
Class 2—with revenue over $100,000 and under $1,000,000	178
Lessors to Class 2	8
Class 3—with revenue less than $100,000	206
Lessors to Class 3	11
Switching and Terminal	245
Proprietary (Railway companies which are part of a system but file their own reports)	172
Circular (Private roads filing by brief circular)	60
Unofficial (Not required to file regular reports)	16
Total	1302

Class 1 Railways and Lessors operate 94.54% of total operated mileage
Class 2 Railways and Lessors operate 3.78% of total operated mileage
Class 3 Railways and Lessors operate 1.28% of total operated mileage

TOP STEAM RAILROADS IN U. S. A.

OPERATED MILEAGE, LOCOMOTIVES AND CARS

Railroad System Figures Include Leased Lines, Affiliates and Trackage Rights

Railroad System	Road Miles Main & Branch Length of Line	Multiple 2nd, 3rd & 4th Main Track	Yards, Spurs, Sidings, Way and Switch and Crossover Tracks	Total of All Tracks Operated	Number of Locomotives Steam, Diesel and Electric	Number of Passenger Train Cars	Number of Freight and Misc. Cars	Control. By
Santa Fe	13296	1909	5760	20965	1633	1438	86005	
Atlantic Coast Line	4993	688	1500	7291	706	537	21636	
Balt. & Ohio, (Inc. Alton)	7232	2390	4440	14139	2227	1215	89224	
Boston & Maine	1906	584	1077	3689	477	1146	7668	
Central of Georgia	1816	61	808	2685	251	171	8364	I. C.
Central R. R. of New Jersey	661	416	846	1971	390	623	11951	Reading
Ches. & Ohio	3102	975	2062	6127	840	450	69777	Allegheny Corp.
Chicago & Eastern Illinois	912	302	447	1660	154	116	4738	C. & O.
North Western (Inc. Omaha)	9732	1011	3323	13154	1406	1348	54825	
Burlington	10601	1170	3523	14124	1024	835	48250	N. P. & G. N.
Chicago Great Western	1502	130	600	2232	167	81	4640	
Monon	549	—	360	909	127	55	3959	Southern - L. & N.
Milwaukee	10821	1160	3976	16016	1263	968	56618	
Rock Island	7848	631	2887	11291	868	698	32262	
Delaware & Hudson	846	395	569	1810	360	182	11830	
Lackawanna	995	524	876	2561	556	774	17895	
Rio Grande	2550	313	1016	3524	345	186	15273	Mo.P. - West'n. Pac.
Duluth Missabe & Iron Range	546	210	445	1201	139	21	15403	U. S. Steel
Erie (Inc. N. Y., S. & W.)	2506	1484	2011	6015	833	816	27728	
Florida East Coast	685	326	419	1430	108	166	656	A. C. L.
Grand Trunk	1026	382	822	2230	235	85	12000	Can. Nat'l.
Great Northern	8267	678	2875	11678	885	720	45354	
Gulf, Mobile & Ohio	1963	45	561	2578	176	93	7258	
Illinois Central	6635	890	2677	10202	1396	1179	51182	
Kansas City Southern	962	18	483	1463	148	78	4036	
Lehigh Valley	1262	686	1146	3094	382	282	17245	
Louisiana & Arkansas	877	—	229	1106	66	31	2091	K. C. Sou.
Louisville & Nashville	4751	572	2624	7358	932	605	60391	A. C. L.
Maine Central	987	82	292	1361	135	122	4879	
Mpls. & St. Louis	1409	24	341	1817	114	23	4119	

Maine Central	1409	24	341	1817	114	23	4119	
Mpls. & St. Louis								

Railroad System	Road Miles Main & Branch Length of Line	Multiple 2nd, 3rd,& 4th Main Track	Yards, Spurs, Sidings, Way and Switch and Crossover Tracks	Total of All Tracks Operated	Number of Locomotives Steam, Diesel and Electric	Number of Passenger Train Cars	Number of Freight and Misc. Cars.	Control By
Soo Line (Inc. W.C., DSS & A.)	4827	96	2009	6847	325	260	17845	Can. Pac.
Katy	3293	67	1318	4750	310	203	7749	
Missouri Pacific	10390	557	2922	10576	982	715	33097	
Nash., Chatt. & St. Louis	1090	59	597	1746	206	165	6731	L. & N. - A. C. L.
New York Central	12209	5469	8187	24374	3934	4741	165171	
Nickel Plate	1688	258	947	2893	325	98	14297	C. & O. - Allegheny
New Hav. (Inc. N.Y.,O. & W.)	2384	1034	1825	5580	819	1590	15605	
Norfolk & Western	2155	638	1753	4546	595	402	60921	
Norfolk Southern	733	9	172	914	51	31	1284	
Northern Pacific	6956	800	2235	11070	842	577	43756	
Pennsylvania	11596	5637	10958	28194	4543	5600	247250	
Pere Marquette	2102	304	1153	3559	291	120	14652	C. & O.
Reading	1379	730	1428	3578	683	785	33035	B. & O.
Frisco	4846	144	1857	6847	602	426	28355	
Cotton Belt	1617	126	634	2377	206	82	4930	Sou.-Pac.
Seaboard	4241	65	1436	5743	558	385	18708	
Southern	7735	1079	2984	10573	1593	909	57845	
Southern Pacific	12852	998	5834	15355	2020	1886	65120	
Texas & Pacific	1889	134	766	2799	290	165	7750	Mo. Pac.
Union Pacific	9837	1541	4304	15685	1508	1160	55232	
Virginian	659	30	378	1068	141	28	12184	
Wabash (Inc. Ann Arbor)	2703	524	1447	4674	437	190	19623	
Western Maryland	847	107	425	1395	233	57	10582	
Western Pacific	1195	183	496	1874	177	89	6099	
Subsidiaries Included in the above, as indicated.								
Alton	959	292	467	1718	162	111	3181	B. & O.
Ann Arbor	294	—	129	423	32	10	1187	Wabash
Duluth, So. Shore & Atlantic	535	5	120	660	32	18	1845	Soo Line
New York, Ontario & Western	546	208	248	1002	102	174	2722	New Haven
N. York, Susquehanna & West.	143	24	93	260	39	28	510	Erie
Chgo., St. P. Mpls. & Omaha	1629	223	654	2506	244	133	6571	North Western
Wisconsin Central	1121	26	397	1440	107	63	5589	Soo Line

LINE HAUL RAILWAYS AND SUBSIDIARIES

NUMBER OF COMPANIES, 1057

Miles of Track Owned and Miles of Track Operated as of Jan. 1, 1942

	Miles Owned	Miles Operated
Road Miles, First Main Track, Length of Line	231971	245240
Road Miles, 2nd, 3rd & 4th Main Track	34696	41166
Miles of Yards and Sidings	116483	118196
Miles, All Classes of Track	374691	404602

SWITCHING AND TERMINAL RAILWAYS

Number of Companies 245

	Miles Owned	Miles Operated
Miles, all classes of track	5955	7444
Total all tracks, line haul, switching and terminal railways	380646	412046

(Totals include 2297 miles operated by U. S. roads in Canada)

(Traffic rights included in operated mileage)

Mileage totals also include 87 small private railways, described as "circular" and "Unofficial," owning about 1500 owned miles of tracks aggregate.

SUMMARY OF LOCOMOTIVES AND CARS

All U. S. Railways as of Jan. 1, 1941

NUMBER OF LOCOMOTIVES

Steam 39491; Oil, Gas & Electric 1687; Electric Units 855

	All Operating Companies	Class I Railways
FREIGHT TRAIN CARS:		
Box	708682	705366
Flat	65752	60785
Stock	54674	54529
Coal	809538	790825
Tank (excluding privately owned)	8836	8036
Refrigerator	21772	21732
Other Cars	14917	12390
Caboose Cars	22216	21417
Freight, Total	1,684,171	1,653,663
PASSENGER TRAIN CARS:		
Coaches	17470	17317
Combination Coach	3207	2955
Parlor & Sleeping (excluding pullman)	422	419
Dining	1535	1535
Club, Lounge & Observation	370	368
Postal	1829	1829
Baggage & Express (non-passenger)	13087	13027
Other Passenger Train Cars	388	367
Passenger Cars, Total	38,308	37,817
Company Service Equipment	77811	75626
Motor Cars & Trailers (Class II only)	—	4081

PRIVATE CAR COMPANIES OWNING 500 OR MORE CARS IN THE UNITED STATES

Name of Company	No. of Cars Owned
Armour	5067
Barrett	1535
Burlington Refrigerator Express	2091
Berwind-White Coal Mining	2781
Cities Service Oil	2403
Continental Oil	1209
Cosden Petroleum	621
Cudahy Packing	1438
Du Pont	880
Deep Rock Oil	665
Ford Motor	1339
Fruit Growers Express	14514
Gen'l. American Transportation Corp.	17620
General Chemical	582
Gulf Oil	1551
Keith Railway Equipment	688
Magnolia Petroleum	899
Mather Stock Car	2490
Merchants Despatch	12970
Mexican Petroleum	2138
Mid-Continent Petroleum	2189
Morrell Packing Co.	544
National Car Co.	1233
New River & Pocahontas Coal	977
North American Car Corp.	7350
Northern Refrigerator Line	4774
North Western Refrigerator Line	3643
Pacific Fruit Express	36330
Phillips Petroleum	2613
Pullman Co.	8478
Railway Express Agency	804
St. Louis Refrigerator Car Co.	835
Shell Oil	3845
Shippers Car Line	7643
Sinclair Refining	6444
Socony-Vacuum Oil	1269
Solvey Process	500
Sun Oil	1028
Tidewater Oil	1573
Union Oil of California	643
Union Tank Car	38733
War Dep't. - U. S. A.	2939
Western Fruit Express	7050
Western Refrigerator Line	500
Wilson Car Lines	1802

In the United States, there are 503 private car companies that own a total of 240654 cars. In Canada, there are 31 private car companies that own a total of 4676 cars and in Mexico there are 5 private car companies, owning 1279 cars.

In the United States, 196 private car companies own less than ten cars each and 17 private car companies in Canada own less than ten cars each.

Sources of Information:

U. S. Bureau of Transport Statistics, I. C. C.	1942-1943
Research Department—Encyclopedia Britannica	1943
Railway Pocket List	1943
Moodys Manuals	1940-1943

Thanks to Mr. Kenneth Vernon, Comptroller, Rock Island Bank & Trust Co., Rock Island, Ill., and Mr. "Al" Olson, Ass't. Mech. Engr., Chicago, Rock Island & Pacific Ry., for making available the Moodys Manuals and Pocket Lists.

—A McClure photo.

Argentine Central Ry. Shay type Loco. No. 4. Lima (1832) 1907. Photo taken in 1908 top of Mt. McClellan. Top reached by means of Switch Back

Brief History of The Argentine Central Ry. Co.

By M. C. Poor

This little narrow gauge railroad was one of the interesting scenic routes built in the mountainous district west of Denver, Colorado, shortly after the turn of the century. According to the Georgetown Courier of August 4, 1906, the primary object in building the railroad, was to reach the Waldorf group of mines. After the road was completed to this point it was obvious that the extension of the road on to the summit of Mt. McClellan would furnish an unsurpassed scenic attraction. The line was called the "Gray's Peak Route," and was well advertised as America's most scenic one day trip, or a life-time in a day. This slogan was a very appropriate one, for the trip which started in Denver, included the spectacular and beautiful mountain scenery along Clear Creek, the famous Georgetown Loop and bridge, and the climb through the large and interesting snow-bank formations and ice palaces to the summit of Mt. McClellan.

The Colorado & Southern Railway took these tourist trains direct from Denver via the famous Clear Creek route of the old Colorado Central to Silver Plume. Here the Argentine Central would couple on one of their Shay engines and drag the little two-car train to the summit. The depth of the cinders that are to be found along the old abandoned right-of-way, even to this day, is genuine evidence of the energy put forth as those old Shays worked their way up. The tourist cars used, were built with large windows designed especially for sight-seeing purposes.

The line of the road ran east out of Silver Plume, climbing Leavenworth Mountain by means of a switch-back. At this point the road had already gained considerable altitude and an excellent view of Georgetown and the valley, which lay far below, was to be had. From here the road followed up Leavenworth Creek Canon to the Waldorf Mines, and thence by means of a double switch-back, numerous curves, and some grades, that at times were as steep as 10%, reached the summit of Mt. McClellan. The minimum radius of some of those curves was 145 feet.

Thus within a period of some four and three-quarter hours travelling time, a passenger was carried from an altitude of 5,182 feet in Denver to Mt. McClellan's summit, 14,007 feet above sea-level. Here the tourist was rewarded with a magnificent view of the surrounding Rockies. On a clear day it was claimed that from the summit, one-sixth of the entire state of Colorado and over 106 mountain peaks were visible, including some of the more prominent peaks such as Gray's Peak, Mt. Evans, Mt. Rosalie, Torrey's etc.

The road was first organized as The Argentine Central Railway Company and chartered under the laws of Colorado on August 12th, 1905, by Captain Edwin B. Wilcox of Lynn, Mass. Captain Wilcox owned $300,000 worth of the $500,000 capital stock of the road and was President and Treasurer. Construction was started immediately, and the first

portion of the road was opened for business in January 1906, and opened throughout on August 12th, 1906. The distance from Silver Plume to the summit of Mt. McClellan was 15.9 miles. There was also a short one-half mile spur built from the Waldorf Mines to the Vidler Mine Tunnel. The railroad was three-foot gauge, and 40 pound rail was laid throughout.

Not much information has come to light concerning the actual operation of trains on this 16 miles of mountain railroad. In an effort to learn something about the operation of Argentine Central trains, the writer contacted Mr. Jess Frazier, an old time railroad man who worked on some of Colorado's mountainous railroads, who replied as follows:

"From old time photographs we know that trains left Silver Plume with the Shay at the head end, and that trains returned to Silver Plume with the Shay at the head end. There were very few sidings constructed along the line, and, with one exception, those that were built, were blind sidings and always entered the main on the up-grade to prevent any spotted cars from getting away and galloping down hill. All old photographs of the upper switch-backs between Waldorf Mines and the summit, show the Shay on the head end or up-hill end of the train. The Shay was also shown on the head end upon arrival in Silver Plume, although it was running backwards. This is explained as follows: Upon arrival at Waldorf, on the descending run, the coaches were spotted on an outer passing track. This passing track was fairly level and thus permitted the crew to spot a train here with a reasonable degree of safety, while the Shay then maneuvered around to the head end by means of the inner passing track."

At the time of the road's opening they had only one Shay geared engine. However, the records show that by 1907, the road's rolling stock consisted of five Shay geared engines and five miscellaneous freight cars. In 1916 the records show 3 engines and 16 miscellaneous freight cars. The author has not been able to find any record of any passenger equipment as being owned by the Argentine Central. History tells that the passenger equipment was furnished by the Colorado & Southern Railway, and all photographs of Argentine Central rolling stock tend to bear this out. Thus it is assumed that the road owned no passenger coaches. No disposition is known regarding any of their Shay engines, except that numbers four and five, built by Lima in 1907, were sold to The Feather River Lumber Company out in California. It is to be assumed that the balance of these little engines eventually found their way to various logging roads in the west.

It soon developed that the principal business of the Argentine Central was the summer tourist trade, however the road had at times, a sizeable amount of ore traffic from the mines located along its route, some of them even being located at the end-of-track on the summit of the mountain. Most notable of these mines was the Waldorf group, located about one-half way up. This ore traffic was more or less seasonable also, as mining operations were greatly hampered due to the high altitude and severe weather conditions in the winter season. In-

—A McClure photo.

Argentine Central three-foot gauge, Shay geared Loco. Lima (1832) 1907. Cyls. 11x12"; Drivers 32".
This view taken at the A. C. Shed in Silver Plume, Colo. No. 4 sold to Feather River Lumber Co.,
becoming their No. 2.

ARGENTINE CENTRAL RAILWAY—Grays Peak Route.

D. W. Brown, Prest., Denver, Colo.
Chas. M. Heberton, Vice-Prest. and Treas., Denver, Colo.
C. S. Birkins, 2d V.-P., Idaho Springs, Colo.
A. J. Woodruff, Sec'y, Denver, Colo.
C. J. Morley, Gen. Counsel, "

E. J. Tuttle, General Manager, Denver, Colo.
E. J. Tuttle, G. F. & P. A., "
Geo. B. Lott, Gen. Auditor, "
A. G. Beverly, Master Mechanic, Silver Plume, Colo.

57	51	Spl.	Mls	*June*, 1910.	54	Spl.
A M	A M	A M	.....	(*Mountain time.*)	P M	P M
*9 00	*8 10	*8 00	0	lv..**Denver** (*C. & S. Ry.*).ar.	6 15	7 00
9 40	8 52	8 40	16	.....**Golden**.....	5 36	6 18
10 58	10 37	9 58	37	.....**Idaho Springs**.....	4 07	4 59
11 40	11 25	10 40	50	.....**Georgetown**.....	3 22	4 20
12 01	11 50	11 01	54	arr....**Silver Plume**....lve.	3 00	4 00
12 05	12 05	11 05	0	lv..**Silver Plume** (A. C. Ry.).ar.	2 55	3 55
– –	– –	– –	6	.....Sidneyville.....	– –	– –
1 02	1 02	12 02	9	.....Waldorf	1 58	2 58
– –	–	– –	12	.....Independence.....	– –	– –
– –	– –	– –	15	..... Ice Palace.....	– –	– –
1 40	1 40	12 40	16	....**Summit Mt. McClellan**....	*1 15	*2 15
P M	P M	Noon	....	ARRIVE. DEPART	P M	P M

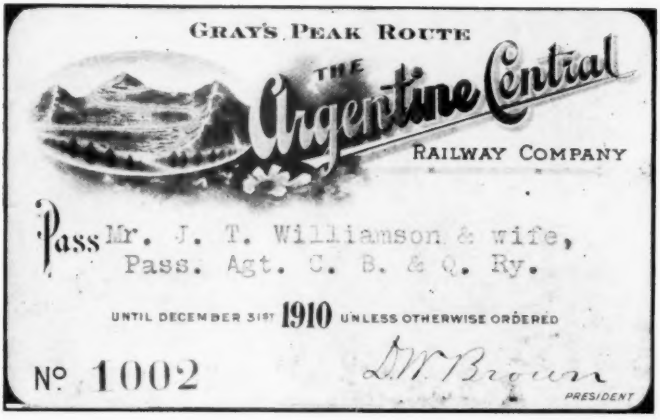
Highest standard railroad in America. The trip from Denver to the summit of Mt. McClellan is the most scenic one-day excursion in the Rockies.

* Daily.

Connection.—At Silver Plume—With Colorado & Southern Ry.

—From Collection of M. C. Poor.

Copy of "Argentine Central" Time Table from July 1910 Official Guide.



—Collection of M. C. Poor.

An A. C. "Annual."

asmuch as there was practically no freight business, and no passenger traffic at all, the road as a rule was closed down during the mid-winter season. The summer tourist business lasted from about May the 15th until about November the 1st. A typical summer passenger schedule as published in the July, 1910 Official Guide, shows two daily passenger trains each way. It required about 1 hour and 40 minutes to make the 16 mile trip, either up or down.

On June 17th, 1909, Captain Wilcox sold his $300,000 interest to a new organization known as *The Gray's Peak Scenic Development Company,* and passed out of the picture. This new company took over the property and operation of the road. However, they continued to operate the road under the name of the Argentine Central. This new company planned to extend the line of the road to the summit of Gray's Peak. Inasmuch as Gray's Peak is 14,274 feet in altitude, this proposal called for some pretty difficult railroad construction and would require some 2½ more miles of track. The plans fell through for some reason and nothing more was ever heard of the idea.

Business was not coming up to the company's expectations and the deficits began to pile up. For example, the Profit and Loss statement for the year ending June 30th, 1910, shows the following results:

Gross passenger earnings	$20,005.00
Gross freight earnings	2,899.00
Miscellaneous earnings	566.00
Total gross earnings	$23,470.00
Year's expenses including $12,000.00 bond int.	49,948.00
Total deficit for the year	$26,478.00

As a result of this continued poor business, the company went into receivership on August 3rd, 1911. The road was scheduled to be put up for sale, however interested parties intervened and the sale was ordered stopped by the State Supreme Court with the understanding that the road was to be re-organized. Accordingly a new company known as *The Georgetown & Gray's Peak Railway Company* was incorporated on June 5th, 1912, as successor to the old Gray's Peak Scenic Development Company and the Argentine Central Railway Company. This new company, The Georgetown & Gray's Peak Railway, was in turn leased to another new organization known as *The Argentine & Gray's Peak Railway Company,* who operated the road.

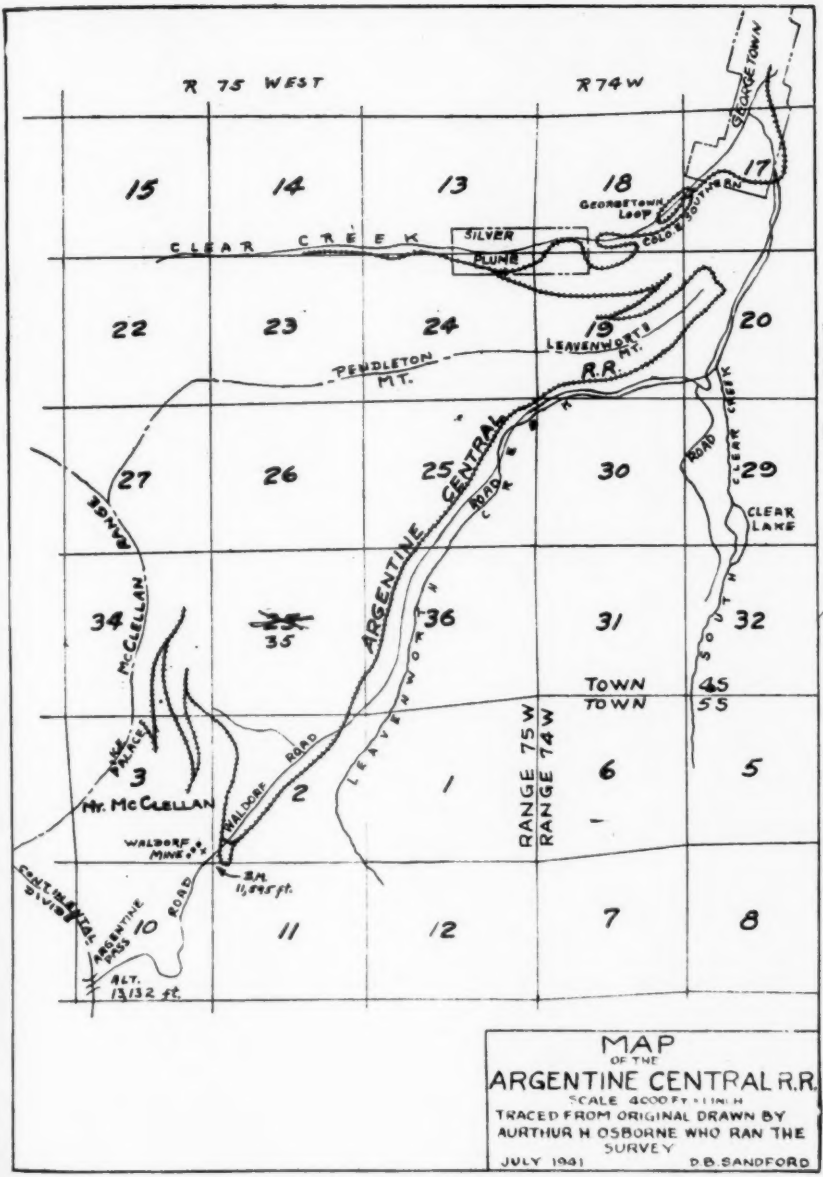
The author has a copy of a letter written by a Mr. W. R. Houghton, Chief Auditor of The Georgetown & Gray's Peak Railway Co., under date of June 26th, 1913, which states in part: "There is a company known as The Montezuma & Western Railway Company that has been organized for the purpose of constructing a line of railroad which will serve this territory, and if said line is constructed, it will make the Argentine Central a thing of the past. It is quite possible that The Montezuma & Western will form a combination with the Georgetown

& Gray's Peak Railway for the purpose of buying the rails and engines of the old Argentine Central, but if this does not happen, the road will have to be junked eventually."

It would be interesting to know just where this proposed Montezuma & Western was going to build their road.

Another source of history states that the Montezuma & Western interests planned on constructing a line of railroad between a point near the Waldorf Mines on the Argentine Central, and Keystone, Colorado. Their plans called for the construction of a 7,521 foot tunnel under Argentine Pass. From here the proposed line was to follow down Peru Creek and Snake River to Keystone where it would connect with the Colorado & Southern at Keystone. By securing some sort of a trackage or traffic agreement with the Colo. & Southern, they would then have an entryway into Leadville. With such a direct line across the mountains the Montezuma & Western would then form an important connecting link between Denver and the Leadville mining district. Nothing more was ever heard of this scheme though and it is assumed that the idea fell through.

Within the next few years what little freight traffic the road enjoyed gradually declined, and the passenger traffic went from bad to worse. The operation of the road ended up on the wrong side of the ledger for each year from 1913 to 1918 inclusive. The mining properties situated at the terminus of the railroad on the top of Mt. McClellan and at other points along the line gradually ceased operations until there was no freight shipped at all during the year 1918, and only a few sight-seeing passengers were carried over an operating period of about six weeks. From such meager business, the road sustained a loss of approximately $3,000.00. Finally on October the 24th, 1918, the road filed an application with the Colorado Public Utilities Commission for permission to abandon and dismantle the line. Inasmuch as the road had been operating at a continuous loss year after year, coupled with the fact that there were no towns or industries located along the right-of-way to offer any objections or protests to the proposal, the Commission granted the request on November the 9th, 1918. The road was dismantled the following year. Thus ends the story of another famous little Colorado narrow gauge railroad.



Drawn by D. B. Sandford.

ARGENTINE CENTRAL RAILWAY LOCOMOTIVE ROSTER

Three Foot Gauge

No. 1: Shay geared type. Lima No. 1561—1905.
Cyl. 10x12″; Drivers 29½″; B. P. 180 lbs.; Weight 65100 lbs.

No. 2. No data.

No. 3. Shay geared type. Lima No. 1674—1906.
Cyl. (3) 11x12″; Drivers 32″; B. P. 180 lbs.; Weight 75700 lbs.
Sold to Uintah Ry. in 1910, becoming their No. 5.

No. 4. Shay geared type. Lima No. 1832—1907.
Cyl. 11x12″; Drivers 32″; B. P. 180 lbs.; T. E. 22,600 lbs.; Weight 83450 lbs. Sold to Feather River Lumber Co., becoming their No. 2.

No. 5. Shay geared type. Lima No. 1833—1907.
Cyl. 11x12″; Drivers 32″; B. P. 180 lbs; T. E. 22,600 lbs; Weight 83700 lbs. Sold to Feather River Lumber Co., becoming their No. 1.

The above data obtained from the Lima Locomotive Works, Lima, Ohio, and Mr. E. L. DeGolyer, Dallas, Texas.

BIBLIOGRAPHY

Mr. R. H. Kindig.
Mr. Jess W. Frazier.
Mr. D. B. Sandford.
Mr. Judson D. Micawber.
L. H. Westcott.
Poor's Manual of Railroads, 1906 to 1919 inclusive.
Colorado Public Utilities Commission Reports.
Rand McNally Map Co.
Official Railway Guide.
U. S. Geological Survey Maps.

MAP OF COLORADO

Our members will be interested to learn that there has been published recently a railroad map of this state. This map, 24x38″, printed in four colors, showing all of the railroads in the state and some that were projected, is well lithographed. In addition, there are 15 large-scale insert maps of areas of especial interest. On the reverse side is the usual list of cities and towns with the key letters showing their location. Also, of especial interest, is a brief history of all of the Colorado railroads together with key letters to designate their location. The map comes folded and enclosed in a heavy envelope for $1.00. For framing purposes, the index and history is printed separately and mailed with the map in a mailing tube for $1.50. Copies may be procured from Trains Magazine, 1027 North 7th Street, Milwaukee (3), Wisconsin.

Perhaps after reading Mr. Poor's contribution you will feel like owning a copy of this map. We plan to have another one of his contributions in Bulletin No. 65 and, let me add for the benefit of the author, that these two contributions are in no way related to his history on the South Park road. That history is still in the process of completion.

Worth Reading

(Compiled by ELIZABETH O. CULLEN, *Reference Librarian,* Bureau of Railway Economics, Ass'n. of American Railroads, Washington, D. C.)

BOOKS AND PAMPHLETS

Advanced Passenger Car Design, by E. J. W. Ragsdale, chief engineer, Railway Division, Edward G. Budd Mfg. Co., 15 pp. Reprinted by the Company from the Southern & Southwestern Railway Club Proceedings, January 20, 1944, pp. 12-20. ". . . The American public does not like class distinction, nor does it like obvious economies. So the new coach trains will feature a luxury of appointments and an amount of recreational space such as we have not known before . . ." p. 13.

Alphabetical List of Corporate Names of Carriers and Other Companies considered in connection with Valuation Work under Section 19A of the Interstate Commerce Act—Revised to January 1, 1944, by Accounting Section, Bureau of Valuation, Interstate Commerce Commission, Washington 25, D. C. 133 mimeo. 1. Helpful in tracing histories of individual railroads.

American Railroads and the War. Statements of M. J. Gormley (pp. 3-21); W. C. Kendall (pp. 22-30); R. E. Clark (pp. 31-40); C. R. Megee (pp. 40-48); W. E. Callahan (pp. 48-59); C. H. Buford (pp. 60-66); Julius H. Parmelee (pp. 67-76), representing Association of American Railroads at hearing before subcommittee of Senate Committee on Interstate Commerce, November 4-8, 1943, with Foreword and Chart. 76 pp. Available on request to Association of American Railroads, Washington 6, D. C. Foreword, p. 1, states: ". . . They (the statements) constitute, we believe, the most complete and up-to-date information now available on what has been and is being done to meet war needs for rail transportation." Editorial summary and comment in Railway Gazette, London, England, February 4, 1944, pp. 103-105.

Book of Rules for Model Railroaders, by Lawrence W. Sagle. 191 pp. Illustrations. Diagrams. Published by Model Craftsmen Publishing Corporation, Ramsey, New Jersey. $2.50.

Car Builders' Cyclopedia of American Practice—1943—Sixteenth Edition, compiled and edited for the Association of American Railroads —Mechanical Division. 1324 pp. Illustrations. Diagrams. Published by Simmons-Boardman Publishing Corporation, 30 Church Street, New York 7, N. Y. $5.00. "Historical" p. 5; Dictionary of Car Terms, pp. 11-79; Bibliographies:—Freight Train Cars, pp. 110-114; Passenger Train Cars, pp. 528-530; Motor Cars and Trains, p. 667; Car Shops and Car Maintenance, pp. 1294-1296. Export Cars—Freight and Passenger, pp. 1201-1207.

The First Hundred Years: October 12-13, 1943; October 12-13, 1943, Macon Georgia. ". . .printed and distributed by the Central of Georgia Railway in grateful appreciation of recognition by the Kiwanis and Rotary Clubs of Macon, Ga., whose special programs honored the one hundredth anniversary of this railroad's first train to Macon." Cover-title, 11 pp. Illustrated.

Forty-three Hours—My Era in Railway Equipment Life, by William Carter Dickerman, chairman of the Board, American Locomotive Company. 40 pp. Illustrated. "This Newcomen Address, based upon study and research into American Transportation trends, influences, developments, and progress during the 50 years 1893-1943, was delivered at a Newcomen Dinner held in Dr. Dickerman's honor, at Schenectady, New York, U. S. A., on November 23, 1943." (p. 4). Abstract in Railway Age, v. 115:901-903; December 4, 1943, under title: Awful Immediacy of the Present—A Review of 1893 gives perspective to 1943—the past 50 years suggest the course of the next 50.

. . . *History of the Katy,* by Sylvan R. Wood. *In his* Locomotives of the Katy-Missouri-Kansas-Texas Lines, pp. 7-22, published as Railway & Locomotive Historical Society Bulletin No. 63, January 1944. For sale by the Society: for members, $1.00; for non-members, $2.00.

History of the North Pennsylvania Railroad, by Jay V. Hare, cover-title, 31 pp. Published at Philadelphia, Penn., January 1944. No price given.

Initial Study of Air Transportation, by Subcommittee on Air Transport of Railroad Committee for the Study of Transportation, Association of American Railroads, Washington 6, D. C. 63 pp. including Illustrations, Charts, Tables. Dated: January 1944. Available on request to the Committee. Summary in Railway Age, v. 116: 641-643; April 1, 1944.

Passenger Transport in the United States 1920-1950, by Lewis C. Sorrell and Harry A. Wheeler. VII, 72 pp. Published by Railway Business Association, Chicago, Ill. "The Forecast" pp. 58-69, begins: "Many attempts are being made to project into the postwar period an estimate of national income and industrial activity, but there are so many unknown and unpredictable factors involved that there is no inclination here to join in this pastime, except as to national income for the year 1944, and the passenger estimates of the competing services to the end of the decade. . ."

Railway Equipment—Effect of the War on its Development, and Post War Materials, by E. C. Campbell. 27 pp. His address before Anthracite-Lehigh Valley Section, A. S. M. E., Berwick, Penna., January 28, 1944. Published by American Car & Foundry Co., 30 Church Street, New York 7, N. Y. Title on cover: a. c. f. railway equipment and post-war materials—effect of war on its development.

The Railway Pattern of Metropolitan Chicago, by Harold Melvin Mayer. vii, 168 processed pp. Charts. Tables. Published by University of Chicago, Chicago, Ill. Bibliography, pp. 158-168. ". . . presents a picture of the present railway pattern of metropolitan Chicago, its operation, and its outstanding relationships to the other features of metropolitan organism. . ." Preface, p. ii.

A Review of Railway Operations in 1943, by Julius H. Parmelee. 35 pp. Reprinted by permission from Railway Age, January 1, 1944, figures revised to March 15, 1944, and issued as BRE Bulletin, Special series No. 73, March 1944. Available on request to Bureau of Railway Economics, Association of American Railroads, Washington 6, D. C.

Time-Conscious Cars, by L. K. Sillcox. 34 processed l. Address at Graduate School of Business Administration, Harvard University, December 8, 1943, privately issued by the author. ". . . Ten point four. The statement in itself means nothing. But there is a wealth of meaning implied which can be disclosed by investigation. . ." p. 1. Extracts in Railway Age, v. 116: 631-633; April 1, 1944, under title: Time-Conscious Freight Cars . . .

. . . *Transportation*, by U. S. Congress. Senate. Special Committee Investigating the National Defense Program. cover-title, iv, 43 pp. Additional Report . . .pursuant to S. Res. 71, 77th Cong., and S. Res. 6, 78th Congress, published as 78th Cong. 1st session. Senate. Report No. 10, Part 13. Popularly known as "Truman Committee Report on Transportation." *Railroads*, pp. 6-18. For sale by Superintendent of Documents, U. S. Govt. Print. Off., Washington 25, D. C. 10 cents.

A 12-Point Primer on the Subject of Administrative Tribunals, by Joseph B. Eastman. 3 mimeo. pp. From Mr. Eastman's remarks at the dinner in honor of his completion of 25 years' service on the Interstate Commerce Commission, Hotel Statler, Washington, D. C., February 17, 1944. Printed in Congressional Record, daily Ed., March 22, 1944, pp. A1546-A1547, and in Railway Age, v. 116: 602; March 25, 1944, with editorial note: "What turned out to be Joseph B. Eastman's final public utterance was the speech he made at the I. C. C. practitioners' dinner held in his honor. . . This 'primer' embraces a theme upon which the Commissioner would doubtless have expanded had he not been taken away. Since, as fate would have it, this will be his last instruction on the subject, it is timely now to record it in full: . . ."

Universal Directory of Railway Officials and Railway Year Book 1943-1944, compiled from official sources under the direction of The Editor of The Railway Gazette. iv, 570, 116 [Adv.] pp. Published by The Directory Publishing Co. Ltd., 33 Tothill St., Westminster, S. W. 1, London, England. 20 shillings. ". . . Within the limitations imposed by war conditions, the lists of railway officers have been revised, and the brief descriptions of the chief railway systems of the world, . . . include the most recent changes of which precise information is obtainable. . ." p. ii.

ARTICLES IN PERIODICALS

Air Transportation. Part I: Domestic Aspects. Part II. Problems of the Future. The Index, New York Trust Company, Spring 1944, pp. 1-14.

The Bengal & Assam Railway. Railway Gazette, London, England, November 26, 1943, p. 529. Later information than was available when the Universal Directory of Railway Officials and Railway Year Book 1943-1944, was going to press. ". . . serves nearly the whole of the province of Bengal, a small portion of Bihar, and the whole of Assam. . . A feature of the system is the number of great river crossings mostly by wagon ferries, but the lower Ganges is bridged (Hardinge Bridge) to carry the main line from Calcutta to Siliguri (for Darjeeling) . . ." For still later information see *Road Making in the Far East,* in Transport Services and the War—233, in Railway Gazette, March 17, 1944, which includes map: The transport links between India, Burma, and China, p. 286, which was "adapted" by Railway Age, v. 116; 739-740, for inclusion in *Japs Seek to Cut Railway Operated by U. S. Army,* which mentions: ". . . The U. S. Army Transportation Corps' Military Railway Service, began supervising or operating portions of the Bengal & Assam on March 1. They are under the direction of Colonel John Adams Appleton, T. C., formerly general manager of the New York Zone for the Pennsylvania R. R. . . "

Car Activities of the Association of American Railroads, by V. R. Hawthorne. Western Railway Club, Chicago, Ill. Official Proceedings, November 1943, pp. 14-29. "The subject which you have assigned to me for tonight's paper is such a tremendous one that I can but skim the surface and give you only a brief summary of car activities of the Association of American railroads. . . I do not know of any single publication to which to refer anyone for a complete picture of this subject. . .

. . . There were in interchange service in the United States, Canada and Mexico, owned by railroads and private car lines, as of January 1, 1943, 2,150,164 freight cars. Any one of the above freight cars may be loaded to any destination on the huge system of railroads in these countries. . .

To utilize and maintain this tremendous amount of equipment and to successfully handle this vast amount of tonnage requires the utmost cooperation between the shippers, the owners of the cars and the railroads handling them for loading, transit and unloading. This cooperation is achieved through the Association of American Railroads, which Association is the result of many years of development and experience. This development, so far as car activities is concerned, started in 1864 during the war between the States when interchange of freight cars from one railroad to another was first practiced. . ." pp. 14-16.

Diesel Electric Locomotives in Road Service, by P. H. Hatch. ". . . a progress report on the subject, using as an illustration the intensive operation of diesel electric road locomotives on the Shore Line

of the New Haven Railroad. . ." (p. 134). New England Railroad Club Proceedings, January 11, 1944, pp. 134-146. Discussion pp. 147-156, includes ". . . what 'now can be told' . . . about the Diesel electric without anybody's feelings being hurt. . ." by L. G. Coleman, whose "Is the Steam Locomotive out of Date?" was in the Club's Proceedings, January 1923, pp. 190-199, with Discussion pp. 199-239.

An Easterner's Impressions of the Canadian Northwest, by F. P. Brais. Canadian Railway Club, Montreal, Proceedings, January 10, 1944, pp. 31-37.

". . . I was in a position to look at the territory and its peoples as a railroad man, as a gentleman of leisure and as a politician.

As a railroad man, we roundhoused every divisional point and upstaired and downstaired every store. . . (p. 31)

It might be well here to pause for a moment and look at a map. The country which I propose to briefly describe was covered in two trips; the one by flying practically due north and west to the Arctic Ocean and coming back to Edmonton by a wide sweep to the east to take in the Great Bear and Great Slave Lakes. The other, which followed immediately, takes one over another route further to the west and north, hopping from airport to airport, along the Alaskan Highway, as far as White Horse in the Yukon, and Fairbanks in Alaska. From Fairbanks, we then flew practically due west, to Nome, and to the Bering Straits, where a scant 60 miles separate this continent from Siberia in Asiatic Russia. . . (pp. 32-33)

. . . Canadian Pacific Air Lines have become the life-line of the vast territory which we have been talking about. . . The territory, so far, has been explored by canoe and dog-team. It will now be systematically covered by air. It has now only been scratched, yet it has delivered up millions in riches. The systematic exploration that is now possible, by the same token, should reveal untold wealth. . ." (pp. 46-47)

Electronics Is Here Today, by W. B. Montague, and *Electronic Industrial Applications,* by Alfred Paulus and A. E. LaPoe. (Railway Club of Pittsburgh. Official Proceedings, January 1944 containing Proceedings . . . December 16, 1943), pp. 26-29 and 29-36. ". . . 'Electronics' is a much used and abused word. . . Engineers have been dealing with electronics ever since the days of Michael Faraday. . . As electrical engineers, we have been using electrons ever since electrical engineering came into existence, yet some folks still talk about what a deep mystery electronics is and only about what it is going to do in the future. . . (p. 27)

. . . the use of electronics today has grown by leaps and bounds. Necessity has created new processes and new applications in this war effort. . . (p. 30)

. . . Some phases of that effort cannot be discussed in a meeting of this sort. Radar, of course, is one phase of the discussion which is prohibited. We know and believe that radar will play an important part after the war in transportation, on ships, airplanes, railroads, etc. . ." (p. 31)

Hospital on Rails—First Ambulance Train in Italy Carries Wounded GI's Out of Fighting Zone, by Sgt. Burgess H. Scott. YANK—British Edition, March 12, 1944, p. 9. Illustrated. ". . . consists of a locomotive, salvaged from a demolished roundhouse, and a string of 15 home-made ambulance coaches, scraped together from the odds and ends of run-down Italian rolling stock, left by the Germans when they vacated. . . —officially called the 41st Hospital Train—saves the Army 3,000 ambulance-miles every day. . .

. . . The engineer is Sgt. Howard Schuyler of Jersey City, N. J., who came into the Army via the Jersey Central Railroad, and the fireman is Cpl. Harold Veith, who used to work on the Baltimore & Ohio out of his home town, Indianapolis, Ind. . . The two brakemen, working the train as they would back home, are Pvt. Joseph Lansing of Newport, Ky., who 'braked' for the B. & O. in private life, and Pfc. Harry E. Beals of Emporia, Kans., an ex-brakeman of the Santa Fe. . .

. . . The conductor is Sgt. Henry Smith of Kansas City, Kans., for 17 years with the Santa Fe before he joined the Army.

An Army run is old business to this crew. In Algeria they handled the 135-mile run from Setif to Phillipeville; in Tunisia they operated the train that ran from Kasserine to Sousse, 126 miles. . ."

Maintenance of Way—Why and How, by Col. A. L. Bartlett. New England Railroad Club Proceedings, December 15, 1943, pp. 118-124. ". . . I doubt if there are even a few problems of engineering that do not crop up in the course of a year in the Maintenance of Way Department. . . On the New Haven. . . there are 4,038 miles of main line, branch line and side track. . . In the case of buildings there are something like 2,700 or, in volume, 150,000,000 cubic feet. . . There are 43 miles of steel bridges and 11 miles of highway bridges. There are 1,357 grade crossings. . . There are 1,165 miles of automatic signals, 38 turntables, 228 water plugs and hundreds of miles of steam, air, water and electric lines.

If you bear in mind that all of these facilities are made of materials which disintegrate from natural causes and wear out through mechanical means, you will appreciate the 'why' of the Maintenance of Way Department.

Here is the 'how'. . . I am not going to bore you with a great deal of detail as to what we do or how we do it. But I have selected three subjects about which to talk, for the reason that the process or device was, to a large extent, first used on the New Haven Railroad. . ." pp. 119-120.

The Worst Railroad on Earth, by Bertram B. Fowler. Saturday Evening Post, January 15, 1944, pp. 12-13, 58. Illustrated. ". . . the Transportation Corps' railroad, the Claiborne and Polk. . . It was built as a training area for railroad troops who would be called upon to take over a road on the heels of an invasion and operate it under combat conditions. Into the railroad the men had to build all the handicaps and hazards that might be encountered. . ." p. 12.

New Books

CLEAR THE TRACKS, by Joseph Bromley, 288 pages, illustrated, 8½x5½. Bound in cloth. Published by Whittlesey House, 330 West 42nd St., New York (18), N. Y. Price $2.75.

This is the story of an old-time locomotive engineer. Commencing his career as a call boy on the Utica & Black River R. R., he remains until the road commences to import men who know how to fire coal burning locomotives. He obtains work as a fireman on the Utica-Binghamton branch of the Lackawanna, the source of supply, and before attaining his majority he is promoted to the right hand side of the cab. For about twenty years he piloted the trains over this branch line and then went with the I. C. C. as a safety appliance inspector and continued as such until he was recently retired.

The author has graphically recited his trials and misfortunes as a railroad man in at least the last two decades of the last century. And although some of us may be inclined to feel that "these were the good old days"—there was plenty to take the joy out of railroading. Since that time we have better built locomotives and equipment, better tracks and signals, and better working conditions. The "old man" who could "fire today" and "hire tomorrow" is a thing of the past—so is the man who could run a locomotive better drunk than sober.

I think the chief value of this book lies in the fact that the author has faithfully recorded, to the best of his ability, his experiences as he recalled them. These experiences furnish a contrast to the railroading of today. The reader will find plenty of fun and humor and plenty of the serious as well, but, take it all in all, it makes good reading and it affords a vivid contrast with our present day railroading.

OIL INDUSTRY AND TRANSPORTATION, by P. Harvey Middleton, 60 pages, 9x6. Bound in paper. Published by the Railway Business Ass'n., First National Bank Bldg., Chicago (3), Ill. For price, apply to publisher.

Ever since the attack on Pearl Harbor, we Americans have had it forcibly impressed upon us of the value of oil and its products. This booklet traces the history of the oil industry, from the first oil well in 1859 at Titusville, Pa., to the present time.

The booklet is divided into four chapters. The first covers the historical growth of the industry and early methods of transportation, the second covers the field of petroleum products, the third relates to the development of oil transportation and the last covers the war and post war needs. It is a most interesting and timely booklet, complete with index and bibliography, and is well worth the attention of our membership.

In Memory Of

ELMER E. BOYER
Annual Member
2223 South Patterson St., Sioux City, Iowa
who died on Feb. 9, 1944.

LOUIS E. CRANE
Annual Member
161 Cohannet Street, Taunton, Mass.,
who died on March 11, 1943.

J. M. DAVIS
Honorary Member
Chairman, D. L. & W. R. R.
90 West St., New York, N. Y.
who died on March 2, 1944.

JAMES M. KIMBALL
Annual Member
Hingam Centre, Massachusetts
who died on March 25, 1944.

GEORGE B. LAUDER
Annual Member
Sanbornton, New Hampshire
who died on January 16, 1944.

W. G. LARMOUR
Annual Member
207 West Indian River Road, Norfolk, Va.
who died on December 15, 1943.

RESOLUTION ADOPTED AT THE ANNUAL MEETING OF THE RAILWAY AND LOCOMOTIVE HISTORICAL SOCIETY, INC. AT BOSTON, MASSACHUSETTS, JAN. 9, 1944.

WHEREAS: God in his infinite providence has seen fit to remove from our midst our friend and associate Lieutenant Wendell B. Hovey, a man whose friendship we cherished and who, when the call of duty came, gave his life in defense of his country so that its ideals and way of life might be secure;

THEREFORE, BE IT RESOLVED:

That the Society spread upon its minutes, this record of its loss and transmit a copy of this RESOLUTION to Lieutenant Hovey's parents, in addition to publishing it in the next BULLETIN sent to its membership.

BE IT SO ORDERED.